1996
SHOP MANUAL
SUPPLEMENT

219 100 057

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SAFETY NOTICE

This manual was primarily published to be used by jet boat technicians trained by the manufacturer who are already familiar with all service and maintenance procedures relating to Bombardier made Sea-Doo jet boats.

Please note that the instructions will apply only if proper hand tools and special service tools are used.

It is understood that this manual may be translated into another language. In the event of any discrepancy, the English version shall prevail.

The content depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer modifications, whether authorized or not by Bombardier, after manufacturing the product.

The use of Bombardier parts is most strongly recommended when considering replacement of any component. Dealer and/or distributor assistance should be sought in case of doubt.

Torque wrench tightening specifications must be strictly adhered to. Locking devices (ex.: locking disk, lock nut) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be renewed.

This manual emphasizes particular information denoted by the wording and symbols;

◆ WARNING

Identifies an instruction which, if not followed, could cause serious personal injury including possibility of death.

▼ CAUTION

Denotes an instruction which, if not followed, could severely damage watercraft components.

○ NOTE : Indicates supplementary information needed to fully complete an instruction.

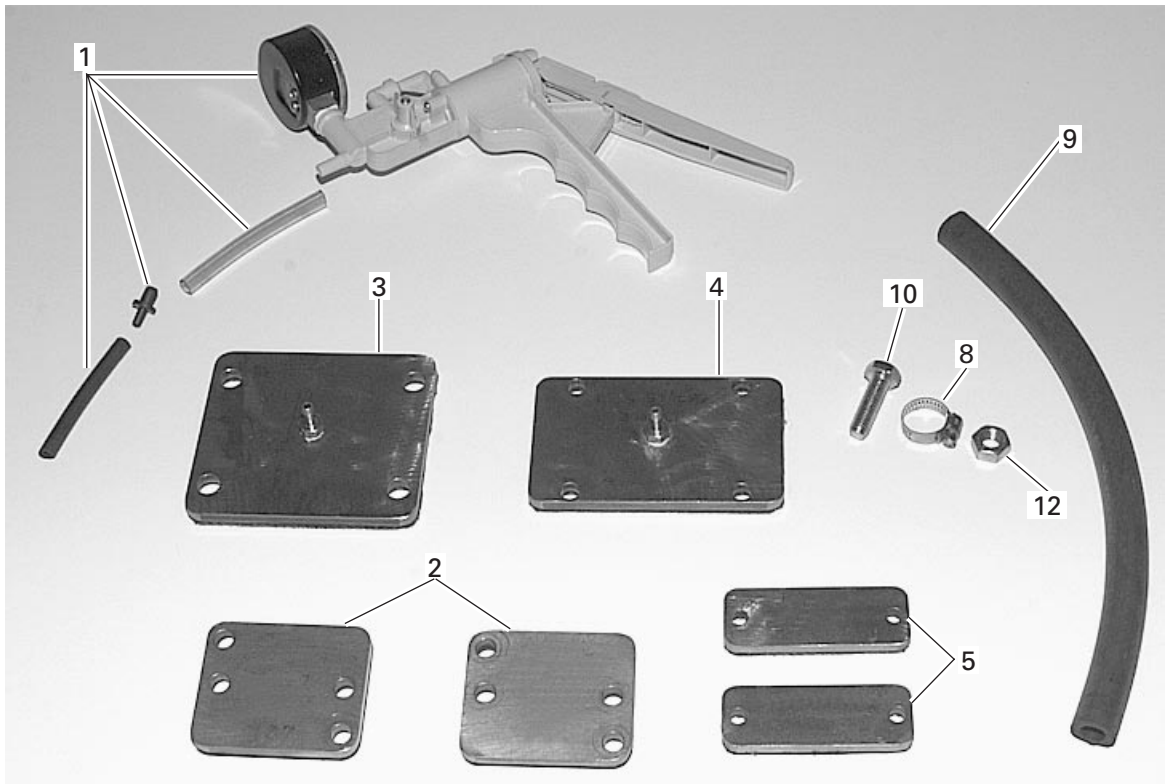
Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use. Always use common shop safety practice.

This information relates to the preparation and use of Bombardier jet boats and has been utilized safely and effectively by Bombardier Inc. However, Bombardier Inc. disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional technician. It is understood that certain modifications may render use of the jet boat illegal under existing federal, provincial and state regulations.

This *Sea-Doo Shop Manual Supplement* contains information regarding the 1996 Jet Boats, Sportster (5895), Speedster (5894) and Challenger (5896)

This manual covers the main differences of this new models. If a particular system is not covered in this manual, refer to the *Sea-Doo Jet Boat Shop Manual* (P/N 219 100 044) to obtain the required additional information.

ENGINE LEAK TEST



1. Pressure Gauge
2. Intake Plate (Punched No. 3) (2)
3. Exhaust Plate for 787 Engine (Punched No. 1)
4. Exhaust Plate for 587, 657, 717 Engines (Punched No. 2)
5. RAVE Plate for 787 Engine Punched No. 4) (2)
6. Nipple (Not Shown)
7. Adapter (Not Shown)
8. Hose Clamp (4)
   Hose Clamp (2)
   Hose Clamp
9. Hose 12.5 mm (2)
   Hose 8 mm
   Hose 12 mm
   Hose 20 mm
10. Screw M12
    Screw M6 (4
    Screw M8 (7)
    Screw M10 (3)
11. Washer (Not Shown) (3)
    Washer (Not Shown) (3)
    Nut M8 (3)
    Nut M10

GENERAL

The Sea-Doo leak test kit provides the means and procedures to test all engines. On multi-cylinder engines, cylinders can not be verified individually due to leakage from one cylinder to another through a common intake manifold.

Static bench testing before and after engine rebuilding is the most effective way to conduct leak testing. Onboard testing does not allow complete access to, and observation of all engine surfaces and should be avoided whenever possible.

When installing hoses from the kit to the engine, ensure to use the collars provided for a good sealing.

When pressurizing the engine, first confirm the sealing of the Leak Test Kit by spraying a soapy solution on all hoses, connections, fittings, plates etc. If it is leaking, bubbles will indicate location. Once it is confirmed to have no leaks, then the testing will continue.

Four areas will be tested in sequence as per the diagnostic flow chart (see the end of this document).

1. Engine cooling system test.
2. Engine test.
3. Crankcase rotary valve gear lubrication system.
4. Test after reassembly.

NOTE : If one leak is found, it is important to carry on and test the next items before overhauling engine. There is a possibility for multiple leaks. If one leak is found you will have to continue pumping to maintain the specified pressure until the next leak is found.

NOTE : A diagnostic flow chart is attached for visual reference at the end of this document.

PREPARATION

Verify fuel system for leaks.

◆ WARNING

If any fuel leak is found or suspected, do not start the engine. Correct the leak and wipe off any fuel leakage. Failure to do this could result in an explosion. Do not use any electric power tools on craft unless system has passed a fuel leakage test.

With engine off, disconnect the BLACK negative cable FIRST.

◆ WARNING

Always disconnect battery cables exactly in the specified order, BLACK negative cable first. Electrolyte or fuel vapors can be present in the engine compartment and a spark might ignite them. Disconnect the RED positive cable last.

NOTE : The disconnection of the battery will not affect the operation of any DESS equipped craft.

TESTING PROCEDURE

Engine Cooling Test

Test pressure:
34 kPa (5 PSIG) for 3 minutes

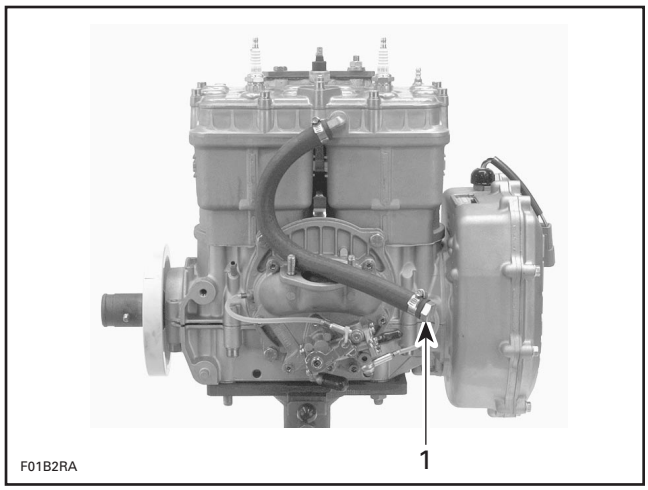
The cooling system is a total loss, non-enclosed design. To leak test the engine portion of the cooling system, it is necessary to eliminate all connections with intake/tuned pipe/muffler system. Disconnect production cooling hoses.

Remove the tuned pipe but leave the exposed exhaust manifold in place, on the engine. Remove the manifold gasket and ensure a clean surface is available.

Install the appropriate exhaust cover plate (punched no. 1 for 787 engine and no. 2 for other engines) from the Leak Testing Kit. Tighten plate using fasteners provided in the kit.

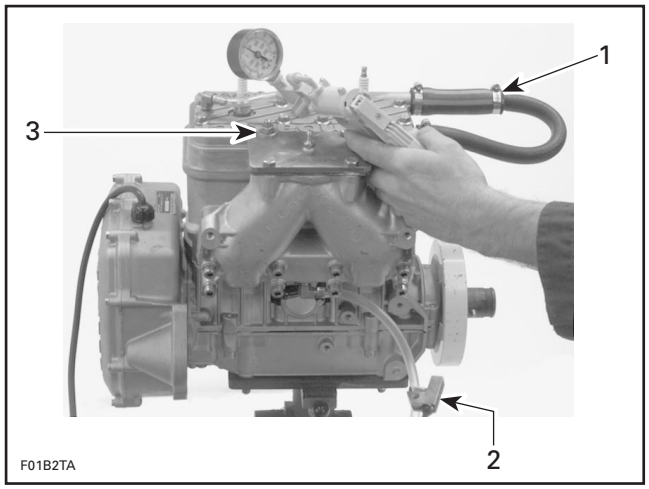
Use hose(s) provided in the kit and install on the engine.

Install pump using reducer and appropriate tube(s) as necessary.



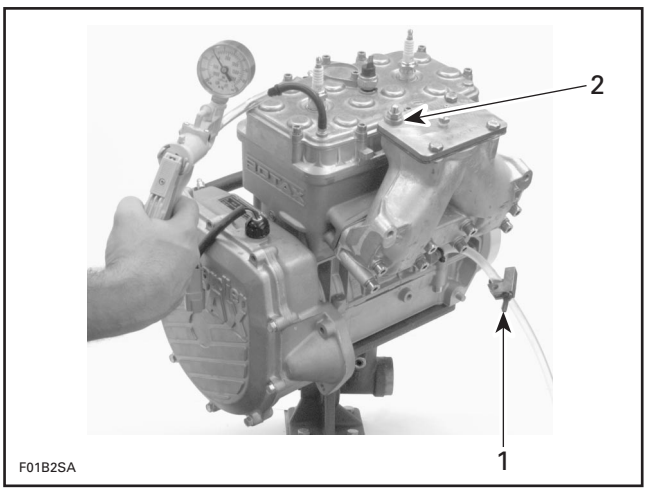
587 ENGINE

1. *Hose with clamps. Plug end with a screw*



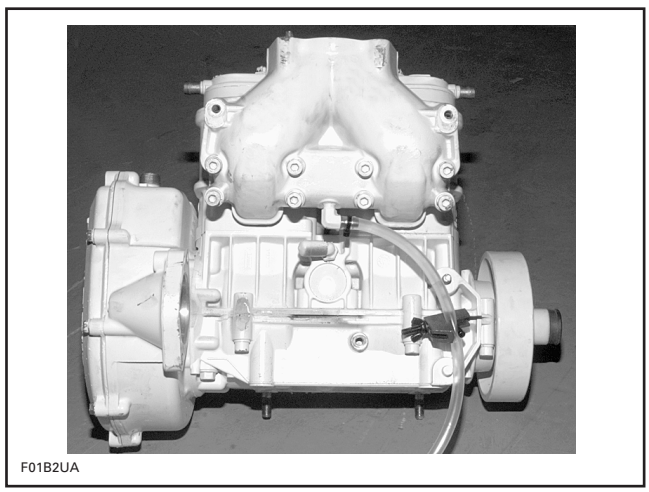
657 ENGINE

1. *Insert small hose inside large hose. Install clamps*
2. *Plug exhaust manifold drain hose with a pincher*
3. *Use 2 washers on exhaust plate here*



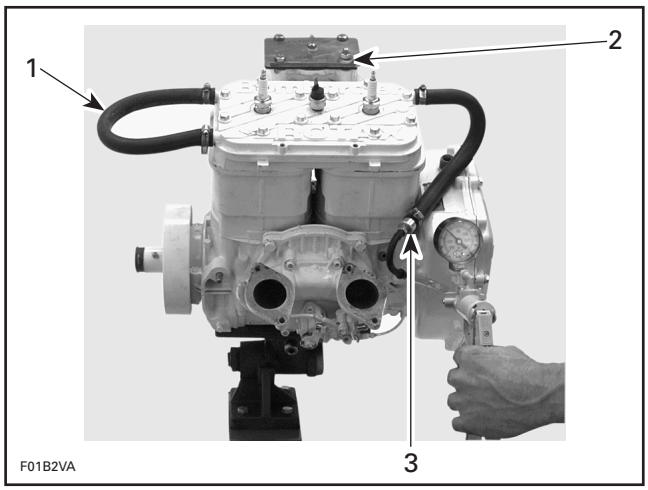
587 ENGINE

1. *Plug exhaust manifold drain hose with a pincher*
2. *Use 2 washers on exhaust plate here*



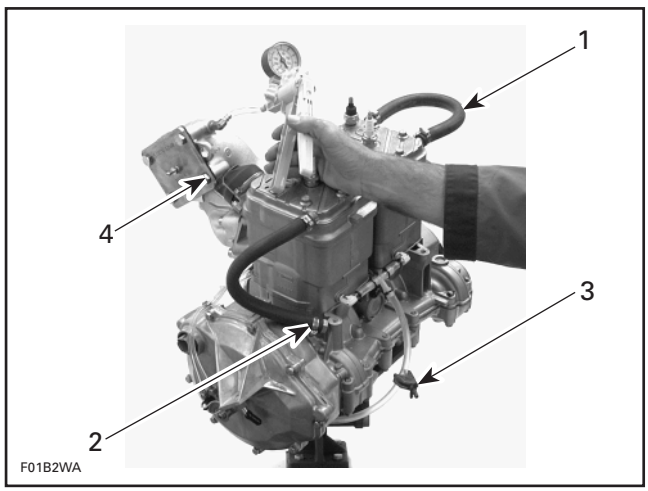
717 ENGINE

1. *Plug exhaust manifold drain hose with a pincher*



717 ENGINE

1. *Loop hose and use clamps*
2. *Use 2 washers on exhaust plate here*
3. *Hose with adapter and nipple*



787 ENGINE

1. *Looped hose with clamps*
2. *Hose with clamps. Plug end with a screw*
3. *Plug exhaust manifold drain hose with a pincher*
4. *Use 2 washers on exhaust plate here*

NOTE : Water is not required in the testing circuit.

Activate pump and pressurize engine cooling system to the recommended pressure.

Let engine stand for 3 minutes. If pressure drops, check all testing components.

– If tester kit is not leaking and pressure drops, check all external jointed surfaces, temperature sensor and the joint between the spark plug area and the engine head cover. If nothing is found here, there is an internal leak and carry on with the Engine Test noting there is a cooling leak and a new cylinder head O-ring/base gasket may be needed.

– If tester kit is not leaking and pressure holds, move on to the engine test procedure. Cooling system leak is now eliminated as a factor.

Engine Test

Test pressure:
34 kPa (5 PSIG) for 3 minutes

Remove the carburetor(s) but leave the exposed intake manifold in place on the engine. Remove the manifold gasket and ensure a clean surface is available.

Install the appropriate intake cover plate(s) (punched no. 3) from the Leak Testing Kit. Tighten plates using fasteners provided in the kit.

NOTE : On engines with the RAVE system, the boots and the O-rings could be checked for leaks by leaving the valves in place. Simply remove the covers to expose the boots.

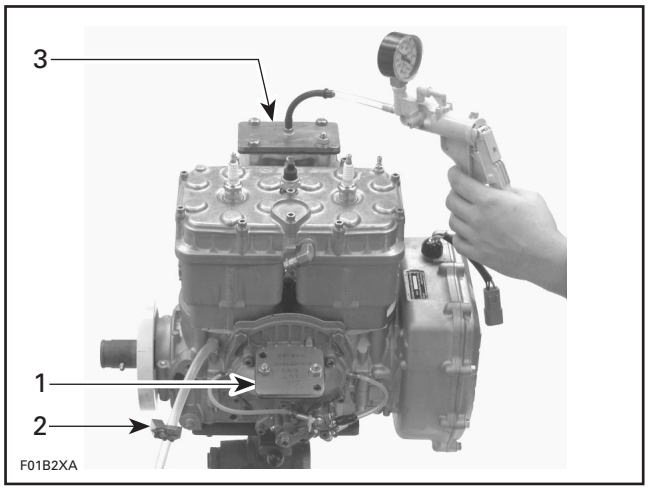
On engines with the RAVE system, remove the RAVE valve assemblies and gaskets (for the MAG side, unscrew the cap to remove separately the housing and the valve). Install the appropriate cover plates (punched no. 4) from the kit. Tighten the plates using fasteners provided in the kit.

Ensure that the spark plugs are installed and tight.

Using hose pincher P/N 295 000 076, block off impulse line.

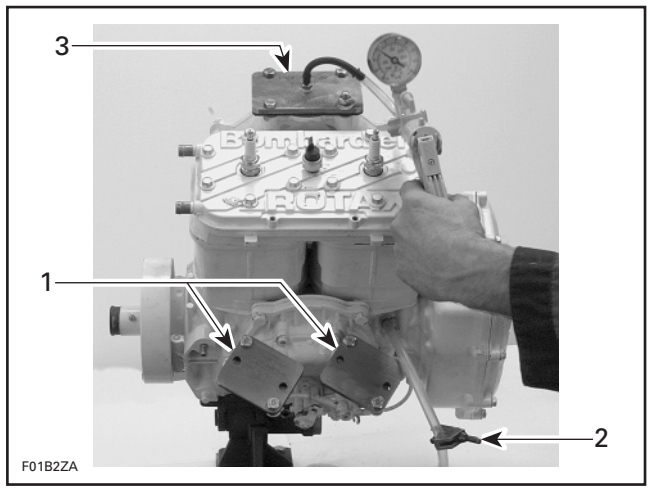
NOTE : Do not block off either of the 2 large hoses of the crankcase rotary valve gear lubrication system.

Install air pump on the exhaust cover plate fitting.



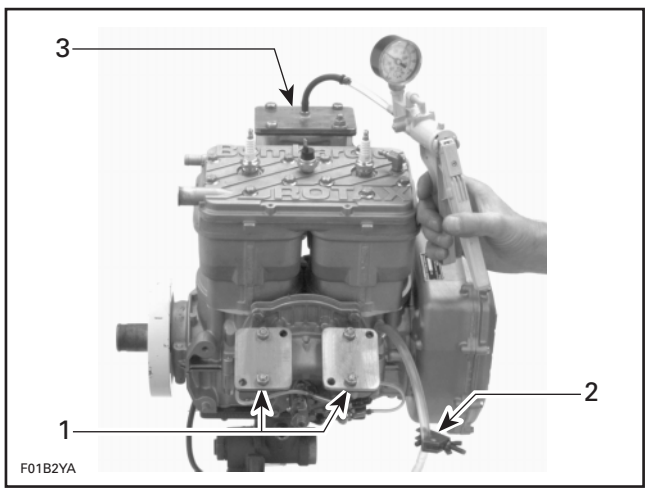
587 ENGINE

1. *Intake plate*
2. *Plug impulse hose with a pincher*
3. *Exhaust plate*



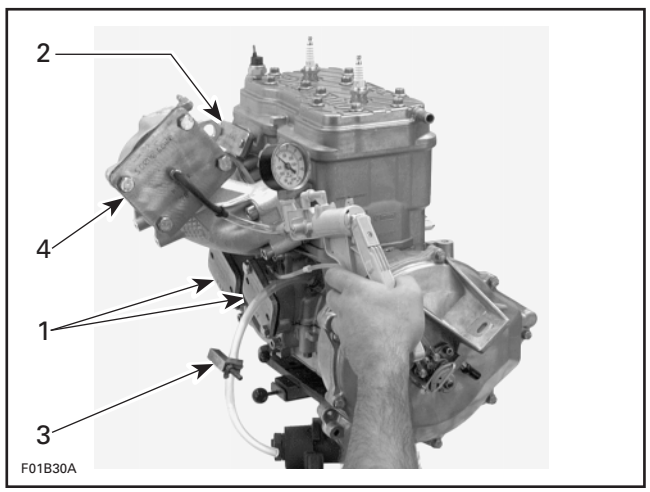
717 ENGINE

1. *Intake plates*
2. *Plug impulse hose with a pincher*
3. *Exhaust plate*



657 ENGINE

1. *Intake plates*
2. *Plug impulse hose with a pincher*
3. *Exhaust plate*



787 ENGINE

1. *Intake plates*
2. *RAVE system plates*
3. *Plug impulse hose with a pincher*
4. *Exhaust plate*

Activate pump and pressurize engine to the recommended pressure. Do not exceed this pressure.

Engine must stand this pressure for 3 minutes. If pressure drops before 3 minutes, check all testing components.

– If tester kit is not leaking then check engine as per following procedure.

Check the following areas:

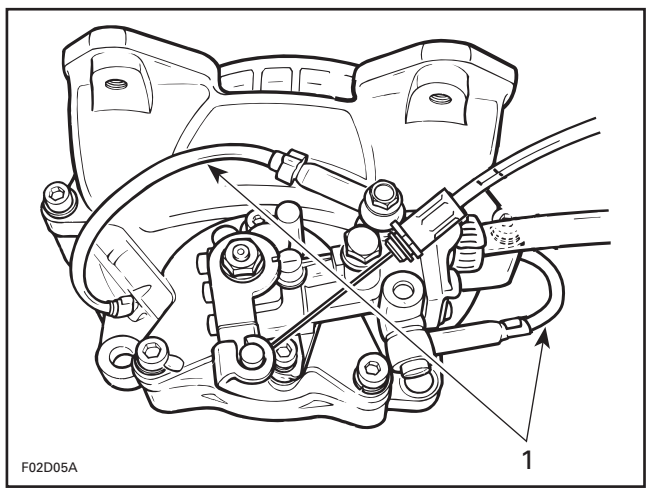
All jointed surfaces, screws, studs etc.

– Spark plug base and insulator

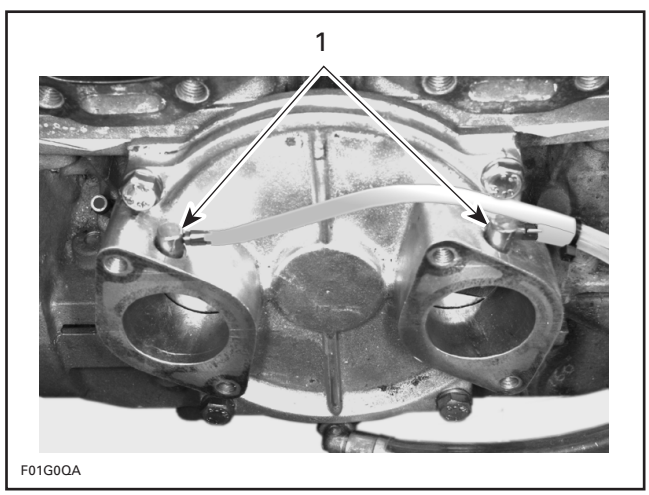
– Cylinder head

– Cylinder base
– Crankcase halves (joint)
– Crankcase caps for counterbalancing shaft of 787 engine
– Rotary valve cover
– Oil injection pump mounting flange (O-ring seal)
– Bleed screws/plugs
– Intake and exhaust manifolds

Small oil injection lines and fittings: Check for air bubbles or oil column going toward pump. It indicates defective check valve in fitting.



587, 657 AND 717 ENGINES
1. Oil injection lines



787 ENGINE
1. Oil injection lines

If leaking continues then block off both hoses of the rotary valve gear lubrication system with hose pinchers P/N 529 030 400.

NOTE : If leakage stops at this point ignore the next steps and go directly to crankcase rotary valve lubrication test.

If leaking continues, remove PTO flywheel to check crankshaft outer seal (and additional O-ring on 787 engine).

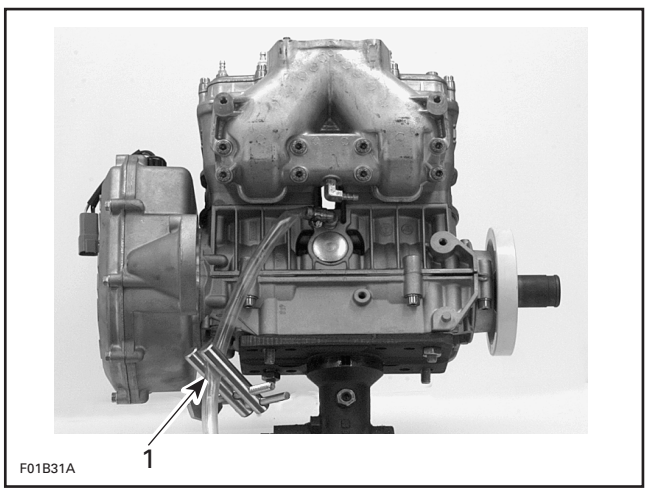
If leaking continues remove MAG side flywheel to check crankshaft outer seal.

If leaking persists then conduct crankcase rotary valve test.

Crankcase Rotary Valve Gear Lubrication System Test

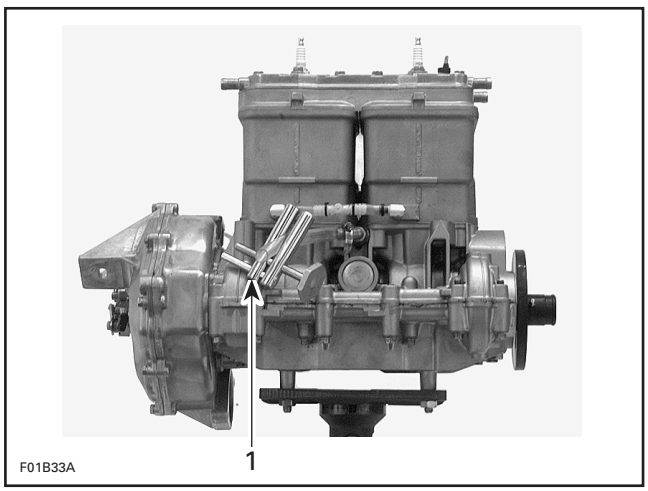
Test pressure:
34 kPa (5 PSIG) for 3 minutes

Block 1 hose of rotary valve gear lubrication system with hose pincher P/N 529 030 400 and install Leak Test Kit reducer and nipple in the other.

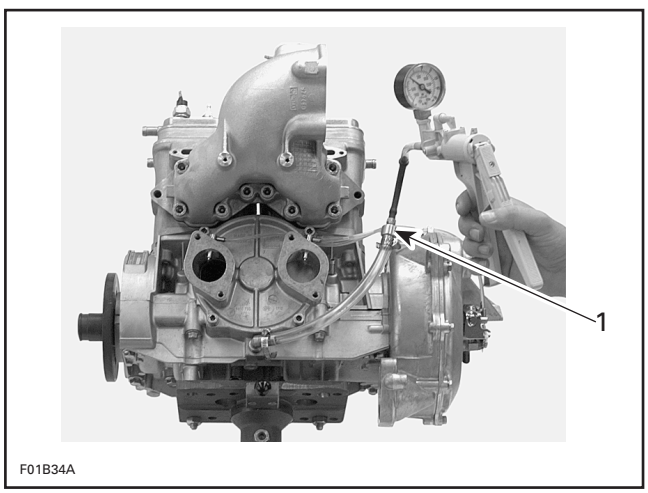


587, 657 AND 717 ENGINES
1. Block this hose with a pincher

587, 657 AND 717 ENGINES
1. *Hose with reducer and nipple*



787 ENGINE
1. *Block this hose with a pincher*



787 ENGINE
1. *Hose with reducer and nipple*

NOTE : It is preferable to have reservoir oil drained from system prior to testing but not mandatory.

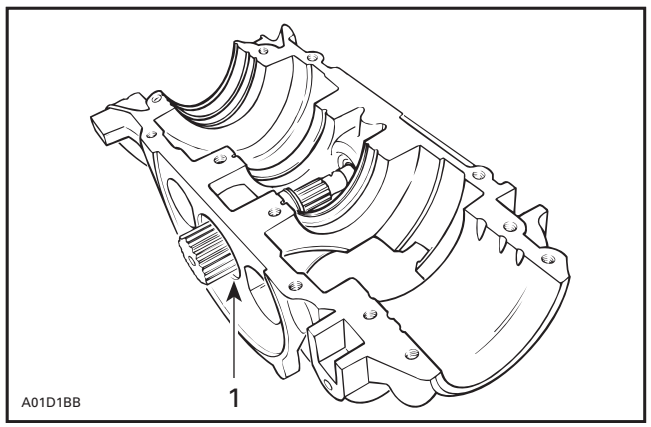
Install air pump on adapter and pressurize as before.

Check cap of rotary valve shaft reservoir in crankcase. It is located just below the oil hose fitting.

Remove PTO side spark plug. If pressure drops, it indicates a defective PTO side crankshaft seal.

Remove MAG side spark plug. If pressure drops, it indicates a defective MAG side crankshaft seal.

If there is a leak, it indicates a defective rotary valve shaft seal. Remove rotary valve cover and check for seal leak with soapy water solution.



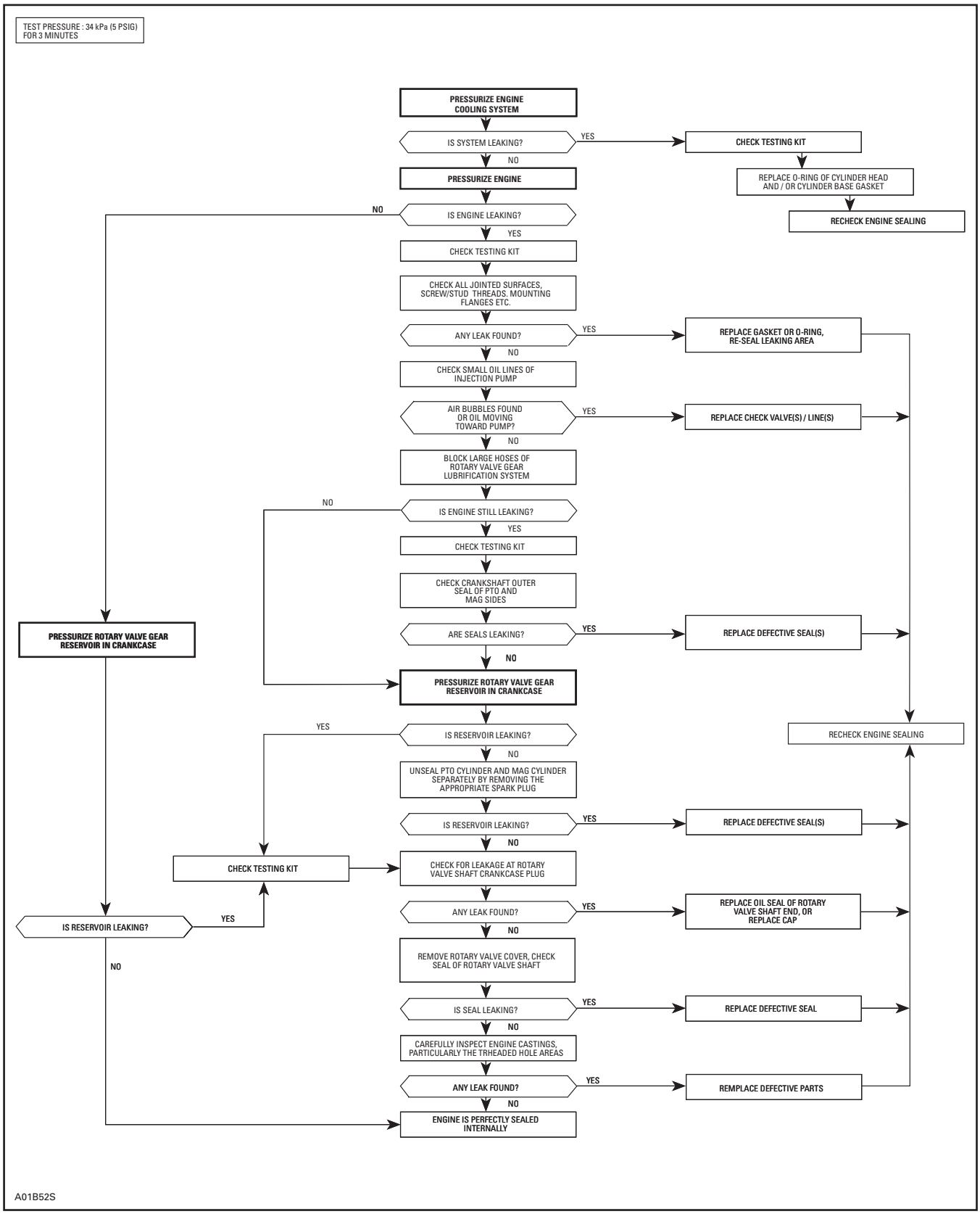
1. Seal

If leak persists, it indicates a defective casting somewhere in the engine. Disassemble engine and carefully check for defects in castings. Pay attention to tapped holes which may go through sealed areas of engine and thus lead to leakage.

REASSEMBLY TEST

After reassembly of engine always recheck for leakage on the bench and after installation in craft.

ENGINE LEAK DIAGNOSTIC FLOW CHART



IGNITION SYSTEM TESTING PROCEDURE, 787 ENGINE

GENERAL

NOTE : Removing the original part and replacing it with a known good part is the most accurate procedure. However a static test, by measuring resistance values, can be performed if no replacement parts are readily available. However keep in mind that a component may statically check good but in fact be defective.

The MPEM (Multi-Purpose Electronic Module) is part of the ignition system as well as part of electrical system. This section gives testing procedure for ignition-related problems. For other type of problems, refer to MPEM section.

▼ CAUTION

Whenever replacing a component in ignition system, check ignition timing.

Spark occurrence can be checked with a tester from Superex Canada Ltd P/N 15-785.

To perform verifications, a good quality multimeter such as Fluke 73 (P/N 529 022 000) can be used.

When dealing with ignition problems, the following items should be checked in this order:

1. Spark occurrence/spark plug condition.
2. Battery condition.
3. MPEM supply fuse condition.
4. Electrical connections.
5. Engine stop/safety lanyard
6. DC-CDI module
7. MPEM
8. Magneto output.
9. Ignition coil output.

The first 4 items can be checked with common automotive equipment. For items 5 and 6, refer to MPEM section. For items 7, 8 and 9, refer to the following procedures.

IGNITION AND RPM CONTROL PROBLEMS

No spark condition

When 4 long beeps come from the monitoring system

It indicates the MPEM is not able to communicate with the DC-CDI (Direct-Current Capacitor Discharge Ignition) module. However, this confirms the MPEM itself is working.

Ensure that the gauges fuse is in good condition and the DC-CDI module receives 12Vdc from the RED/PURPLE/GREEN wire. Ensure there is a good ground through the BLACK wire.

NOTE : To quickly confirm the gauges fuse, press the start button (with or without safety lanyard on DESS post). The low oil injection level light turns on when the fuse is good.

Check all electrical connections of the DC-CDI module. If everything is correct, the DC-CDI module can be suspected. Try a known good one.

When NO beeps come from the monitoring system

Check the trigger coil and the ignition coil. If they test good, the DC-CDI module can be suspected. Try a known good one. If it does not solve the problem, the MPEM module can be suspected. Try a known good one.

Incorrectly controlled engine maximum RPM

The RPM limiter is enclosed in the DC-CDI module. However the actual data for the RPM limiter is stored in the MPEM (Multi-Purpose Electronic Module). Therefore, a problem related with the engine speed control may come from any module.

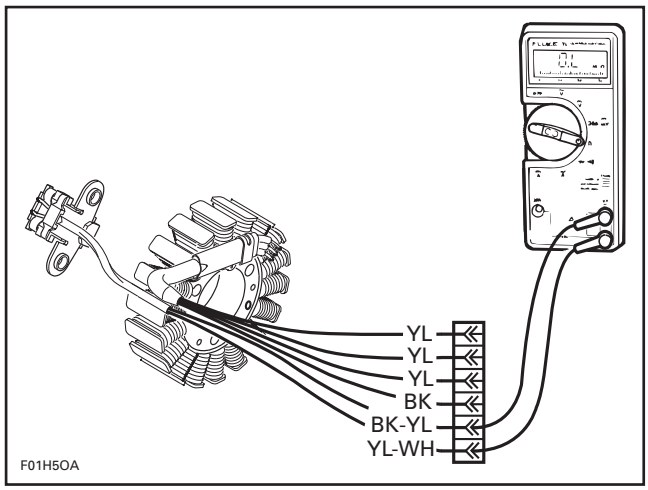
For the maximum engine speed in neutral, first ensure the neutral switch is properly working (refer to MPEM section). Proceed as follows if it tested good.

For the maximum engine speed in forward or reverse, the DC-CDI module can be suspected. Try a known good one. If it does not solve the problem, the MPEM module can be suspected. Try a known good one.

Trigger Coil

STATIC TEST: CONTINUITY

1. Disconnect the stator/trigger coil plug at the engine magneto cover. Connect the 6-pin magneto to test harness (P/N 295 000 136) at the engine. DO NOT connect the other end at the boat's harness.
2. Connect the multimeter leads as shown (BK/YL to one meter lead, YL/WH to the other lead). Resistance should be approximately 242 ohms (± 10%).



TYPICAL

NOTE : The trigger coil encompasses a small permanent magnet. Using a medium sized common screwdriver in the proximity of the magnet, verify magnetism is present (magneto cover removed).

DC-CDI Module

WIRE COLOR	FUNCTION
RE/PU	CDI Power source from MPEM
BK	Ground
WH	To ignition coil
YL/WH	Impulse from trigger coil
BK/OR	Blanks-not used at this time
BK/GR	Blanks-not used at this time
BK	Ground between DC-CDI and MPEM
GY/WH	RPM data to MPEM
WH/BL	Data to MPEM (low voltage)

STATIC TEST: CONTINUITY

+ Meter Lead	- Meter Lead	Value
RE/PU	BK	2.6 KΩ
YL/WH	BK	0.380 MΩ
WH	BK	2.208 MΩ
BK/OR	BK	infinity
BK/GR	BK	infinity
BK	BK	0.2 Ω
WH/BL	BK	30.38 KΩ
BK	RE/PU	2.690 KΩ
BK	YL/WH	0.390 MΩ
BK	WH	2.2 MΩ
BK	BK/OR	infinity
BK	BK/GR	infinity
BK	BK	2.69 KΩ
BK	GY/WH	33.07 KΩ

Ignition Coil

STATIC TEST: CONTINUITY

Primary Winding

1. Remove the 2 female spade connectors from the primary side of the ignition coil.
2. With the meter set on the resistance scale, connect the meter leads to the primary terminals of the coil.
3. Resistance should be approximately .3-.6 ohm.

Secondary Winding

1. With the ignition coil electrically isolated from the rest of the system, remove the spark plug caps from the ends of the high tension leads.
2. The meter function should be on resistance, connect the meter leads to the spark plug leads of the MAG and PTO cylinders, and your resistance should be 12.71K ohms (±10%).
3. Lastly, check resistance of spark plug caps. Install a meter lead where the high tension wire normally goes and the other meter lead where the spark plug connects. A reading of 4.5 to 5.5K ohms is normal.

DYNAMIC TEST

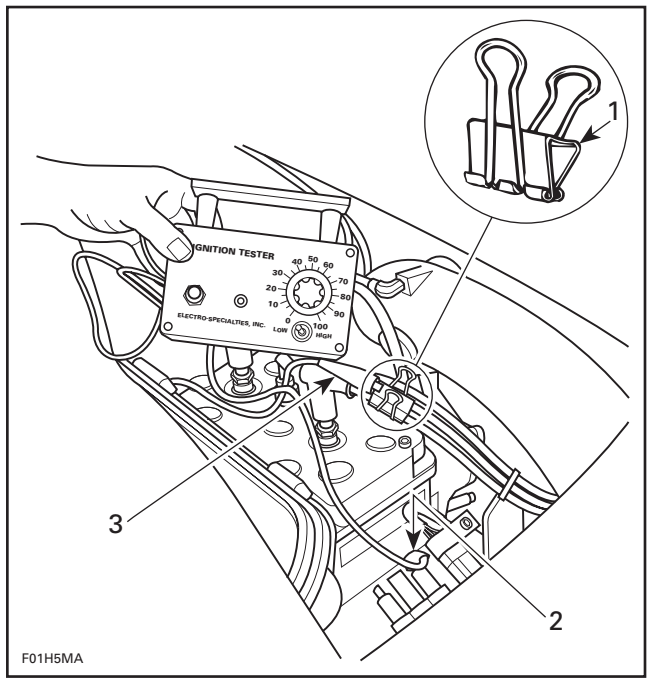
Test can be performed with either the Bombardier ignition tester (P/N 295 000 008) OR the KOWA ignition coil tester (typical), available from after market tool/equipment suppliers.

Testing with the Bombardier Ignition Tester

A paper clip of approximately 20 mm (3/4 in) will be used as a test adapter for the following test.

1. Install the test adapter to spark plug cable **close** to MAG side spark plug. Unplug magneto connector at engine. Connect the 6-pin magneto test harness (P/N 295 000 136) between the unplugged connectors.
2. Connect tester wires then set switch and dial as follows:

Tester wires	Component wires	Tester switch position	Tester dial position
N	Tester adapter (paper clip) on spark plug cable	LOW	35
P	Engine ground		



TYPICAL

1. Paper clip
2. P lead to GROUND
3. N lead on spark plug cable

3. Start engine and observe indicator.

NOTE : If engine starts, allow it to idle while observing indicator. Then, shut engine off.

4. Push reset button and repeat step 3 twice.

RESULTS :

a. **Indicator lamp lights:** Ignition coil is OK.

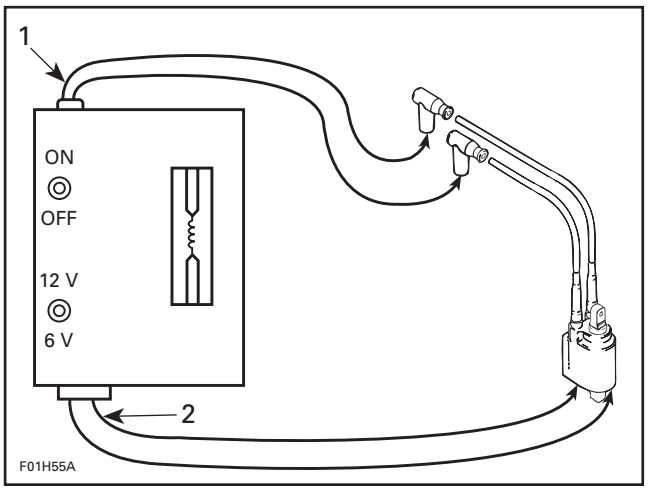
b. **Indicator lamp does not light on one or both cylinder(s):** Repeat the test 3 times to get conclusive results. Ignition coil is faulty. Replace it.

Testing with the KOWA ignition coil tester

◆ WARNING

Do NOT use coil tester on metal work bench. Follow manufacturer instructions.

1. With ignition coil removed from craft, disconnect spark plug caps from high tension leads.
2. Hook high tension leads from tester to ignition coil high tension leads.
3. Connect 2 smaller tester leads to primary of ignition coil.



TYPICAL

1. Leads to secondary
2. Leads to primary

4. Turn power switch to 12 volts and you should observe spark jumping at a predetermined gap of 7 to 8 mm (.276 to .311 in).

If there is no spark, if it is weak or intermittent, the coil is defective and should be replaced.

5. Observe tester operating time recommendations, usually about 5 minutes per coil is sufficient.

IGNITION TIMING, 787 ENGINE

Overview

Normally ignition timing adjustment should not be required. It has been set at factory and it should remain correctly adjusted since every part is fixed and is not adjustable. The only time the ignition timing might have to be changed would be when replacing the crankshaft, the magneto flywheel, the trigger coil, the Nippondenso DC-CDI module or the MPEM. If the ignition timing is found incorrect, you should first check for proper crankshaft alignment. This might be the indication of a twisted crankshaft.

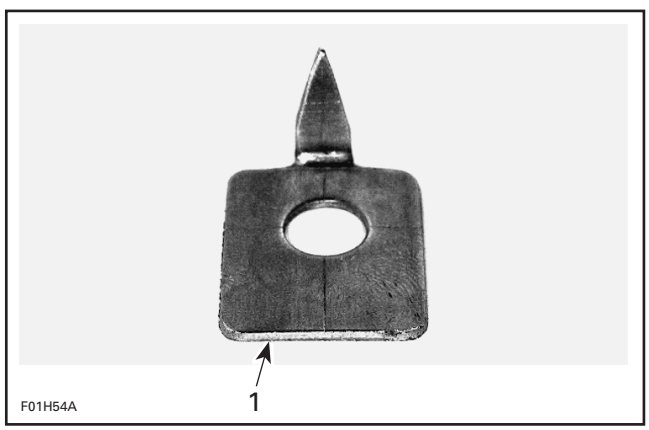
With this new CDI system, the ignition timing can be checked with either the engine hot or cold. Besides the **ignition timing is to be checked at 3500 RPM** with the timing light.

Within 3000 and 4000 RPM, the spark advance does not change. So when checking timing at 3500 RPM, a change in engine speed within ± 500 RPM will not affect the timing mark when checked with the timing light.

Ignition Timing Procedure

STATIC TEST

1. To install the new timing mark pointer tool, first remove PTO flywheel guard. Then remove middle screw securing the engine to the rear crossover motor mount. Reinstall screw with timing mark pointer tool attached.



1. Timing mark pointer tool (P / N 295 000 135)

2. Install a TDC gauge in MAG side spark plug hole. Rotate PTO flywheel until piston is at top dead center.

3. From this point, rotate flywheel clockwise (when facing it) until piston is at 3.38 mm (.133 in) before top dead center.
4. Scribe a mark on PTO flywheel aligned with timing mark pointer tool.
5. Remove TDC gauge, reinstall spark plug and connect wire.

DYNAMIC TEST

1. Connect an induction-type tachometer (P/N 295 000 100) to spark plug wire.
2. Check ignition timing using a stroboscopic timing light connected to the MAG side spark plug cable. Rev the engine to **3500 RPM** and point beam of timing light straight in line with timing mark pointer.

▼ CAUTION

If engine is to be run more than a few seconds, connect a garden hose and supply water to the engine to properly cool it.

NOTE : If mark on PTO flywheel is perfectly aligned with timing mark pointer, no adjustment is required. If it is not the case, refer to the following procedure.

Ignition Timing Adjustment

Since the trigger coil on this engine is fixed and not movable to correct the ignition timing, the MPEM programmer (P/N 295 000 127) is now used to set the timing when an adjustment is required. The programmer will act as if you were moving the trigger coil to advance or retard the ignition timing.

Through the MPEM programmer, the ignition timing can be advanced up to 3° or retarded up to 4°. If the timing is adjusted too retarded, a performance decrease of the engine will be noticed. If the timing is adjusted too advanced, serious engine damage will occur.

▼ CAUTION

If the ignition timing is adjusted too advanced, this will cause serious damage to the engine.

The Timing Correction Chart

The timing marks refer to the physical component position when the spark must occur. The DC-CDI module must be synchronized with these marks. The timing correction just do that. For instance, on a particular engine, the timing correction may need to be advanced to 2° so that the marks align. This is not the real spark advance, just a correction for the tolerances of the mechanical components.

A timing light is still used to check the marks alignment. If the marks are found aligned, the ignition timing is correct and no further action is required.

If the marks are found misaligned, the ignition timing must be corrected. When using the programmer, it will give you the actual correction number that is programmed inside the MPEM. Referring to the chart below, find the corresponding degree and if the correction was made to advance or retard the timing.

Knowing that, you select the higher or lower number to advance or retard the actual timing correction by referring to the chart.

TIMING CORRECTION CHART	Advanced				Retarded			
Number from the programmer (read from MPEM)	2	3	4	1	5	6	7	8
Correction of ignition timing in degrees	3°	2°	1°	0	-1°	-2°	-3°	-4°

Simply put, you just have to change the number the programmer gave to have the timing marks aligned. If the flywheel mark goes in the bad direction after you tried the neighbor value given by the programmer, try the other neighbor value to move the mark in the opposite direction. E.g.: the programmer gave no. 3. You tried no. 4 and the flywheel mark moved in the wrong direction, try the no. 2.

Examples:

a. You found the flywheel mark advanced. You must retard the timing.
   – The programmer gives you the number 3. Referring to the chart, number 3 returns 2°. The timing correction is actually set at 2° (advanced) and this is too much.
   – You estimate the correction should be set to 1° (advanced) to retard flywheel mark so that the timing marks align. Back in the chart, look to find 1° (advanced). This gives number 4. Enter this number with the programmer.
   – You recheck the marks with the timing light and they are now aligned. The adjustment is finished.

b. You found the flywheel mark advanced. You must retard the timing.
   – The programmer gives you the number 3. Referring to the chart, number 3 returns 2°. The timing correction is actually set at 2° (advanced) and this is too much.
   – You estimate the correction should be set to 1° (advanced) to retard flywheel mark so that the timing marks align. Back in the chart, look to find 1° (advanced). This gives number 4. Enter this number with the programmer.
   – You recheck the marks with the timing light and found that the flywheel mark is still too advanced. You know now that the correction made previously was not enough and you estimate the correction should be set to 2° (retarded) to retard flywheel mark more. Back in the chart, look to find 2° (retarded). This gives number 6. Enter this number with the programmer.
   – You recheck the marks with the timing light and they are now aligned. The adjustment is finished.

c. You found the flywheel mark retarded. You must advance the timing.
   – The programmer gives you the number 4. Referring to the chart, number 4 returns 1°. The timing correction is actually set at 1° (advanced) and this is too much.
   – You estimate the correction should be set to 2° (advanced) to advance flywheel mark so that the timing marks align. Back in the chart, look to find 2° (advanced). This gives number 3. Enter this number with the programmer.
   – You recheck the marks with the timing light and they are now aligned. The adjustment is finished.

Adjusting the Ignition Timing with the Programmer

1. Connect the communication cable to the MPEM programmer and the other end to the safety lanyard post on the craft.
2. Press the ***ON/C*** button on programmer and enter you password.
3. Press ***3*** to choose *Vehicle info* in programmer.
4. Press ***4*** to choose *Engine param*.
5. Press ***2*** to choose *Timing adjust*.
6. The programmer display a number that is actually stored in the MPEM.
7. Press ↔ to choose ***yes*** for ***modify*** then press *Enter*.
8. Now punch in the number that corresponds to the degree you want for the ignition timing then press *Enter*.
9. Press *Menu* to go back one level.

10. Press 8 to choose ***Save + Quit*** (even if item no. 8 is not visible on the display, it is active when you select it).
11. Press ***Enter*** to confirm yes you want to ***save modifications*** to the MPEM.
12. You must see ***Operation successful***. This confirms that the new timing has been stored in the MPEM.
13. Unplug communication cable from safety lanyard post on craft.

At this point, you can install the craft's safety lanyard and start the engine to check the effect of the correction on the timing marks. If further adjustment is required, repeat the procedure.

14. Press Off to close the programmer.

NOTE : The MPEM module features a permanent (non-volatile) memory and keeps the ignition timing programmed even when the craft's battery is disconnected.

MPEM (multi-purpose electronic module)

NOTE : The following section gives information for the **Sportster**, **Challenger** and the **Speedster** models. To make the section shorter, the **Sportster** is actually described and the differences for the **Challenger** and **Speedster** are added. Relative to the **Speedster**, the **Sportster** and the **Challenger** MPEM is roughly half the **Speedster** MPEM, actually the starboard (RH) portion.

OPERATION OF MPEM

Accessories

All accessories (bilge pump, blower, navigation lights, auxiliary supply) are directly supplied by the battery. These are protected by fuses located on the fuse block. The fuse block is protected by a separate fuse located in electrical box. Accessories can work with or without the safety lanyard and ignition key.

On **Speedster**, the accessories are connected to both batteries.

Safety Lanyard

This switch is activated by a cap. When cap is over the DESS post, the switch is electrically closed and engine can be started. When the cap is NOT over the DESS post, the switch is opened and engine can not be started.

On **Speedster**, pulling cap from DESS post stops both engines simultaneously when they are running.

33-Second Temporization

Activating the start/stop switch (any switch on **Speedster**) while the safety lanyard is NOT on DESS post will give access to temporization mode. When in temporization mode, the MPEM gauges outlet (PURPLE, PURPLE/TAN and PURPLE/GREY wires) will be activated for 33 seconds. This provides 12 Vdc to each gauge and to the monitoring beeper. Obviously, when in temporization mode, engine will not start. The main function of this mode is to read fuel level.

To Start Engine

Install safety lanyard on boat's DESS post. The MPEM will be energized instantly and will check the safety lanyard cap. If the lanyard is not programmed for the boat, the beeper emits one long beep. If it is programmed, the beeper emits 2 short beep and the gauges outlet will be activated for 33 seconds.

When pressing the start/stop switch (any switch on **Speedster**) while shifter lever is NOT in neutral position, beeper will emit 4 short beeps. To start engine, shifter lever must be in neutral position. A short beep while moving shifter confirms the right position.

When the safety lanyard cap is installed, AND that the shifter lever is in neutral position, engine starting is now allowed by pressing on the start/stop switch (any switch on **Speedster**).

When engine is running, the gauges outlet is activated. A signal from the magneto is sent to the MPEM (to the DC-CDI module then to the MPEM on **Challenger**) in order to determine the engine's RPM. When in neutral, the engine's speed is limited to 3500 RPM. When in forward or in reverse, the engine's speed is limited to 7000 RPM (7200 RPM on **Challenger**).

On **Speedster**, each magneto sends the signal to the MPEM.

To Stop Engine

When engine runs above 1000 RPM, it is possible to stop it by pressing on the start/stop switch. If safety lanyard is removed from DESS post, engine will stop no matter what its RPM is. If the MPEM's ground wire is cut, engine will stop instantly (except for **Challenger**).

On **Speedster**, each engine can be stopped individually by pressing the start/stop switch of the same side of the engine you want to stop. Removing the safety lanyard will stop both engines simultaneously.

RPM Limiter

It has 4 functions:

- Keeps high voltage away from safety lanyard switch (not applicable to **Challenger**).
- Provides engine stop by shorting the ignition system generator coil on **717 engine** and using the MPEM on the **787 engine**.
- Limits engine RPM to 3500 when shifter is in neutral position.
- Limits engine RPM to prevent overreving at full throttle when in forward or reverse.

ELECTRICAL TESTS FOR THE MPEM

The following gives general electrical-related problems, for ignition problems, refer to IGNITION SYSTEM 08-03.

General

To ease working, the engine compartment cover may be removed. Also, the electrical box may be removed from its mounting location then laid flat on engine. For that, loose cable retaining nuts and pull cables out of electrical box.

Always use resistor type spark plugs, otherwise RFI (Radio Frequency Interference) might affect MPEM operation.

If there is an electrical problem, first check battery condition. Never use a battery charger to temporarily substitute the battery; this might give erratic operation or no operation at all.

Check the MPEM supply fuse (2 on **Speedster**). Then, make sure to visually inspect all wirings, connections and fuse tightness.

Wire numbers and connector positions refer to wiring diagram.

When replacing a MPEM, always have battery(ies) disconnected.

Prior to replacing a MPEM, always check electrical connections. Disconnecting and reconnecting the MPEM may cure a "defective" module. The voltage and current may be to low to flow across dirty wire terminals. Carefully inspect terminals for moisture, corrosion or dull appearance. Clean properly then apply silicone dielectric grease when reassembling.

Speedster Only

- Both batteries must be properly connected. Never alter connections of batteries. They are connected in parallel.
- Electric systems are simply doubled, 2 ignition coils, 2 starting solenoids, 2 charging systems etc. Basically the components (ignition coil, rectifier/voltage regulator, starting solenoid etc.) located on one side belong to the engine of the same side (ex: ignition coil located on port side (LH) belongs to the port side engine).
- In the electrical system, basically the same wire colors are used for starboard (RH) and port (LH) sides. To differentiate sides, the starboard (RH) side wires have an additional GREEN tracer on the main wiring harness and on the MPEM.

All Models

IMPORTANT: The following troubleshooting procedures will apply if the problem is not due to one of the above items.

DESS Post

All Models Except Challenger

If it is impossible to stop engine with safety lanyard, check BLACK/RED/GREEN wire (additional BLACK/RED wire for port side (LH) of **Speedster**) connection first.

All Models

Disconnect DESS post connector behind dashboard to check its operation. Using an ohmmeter, take a resistance reading between BLACK and BLACK/YELLOW of DESS post wires. When safety lanyard cap is not over its post, the resistance reading should be greater than 20 MΩ. When cap is over post, the reading should be not greater than 1 Ω.

When safety lanyard cap is on its post, it is possible to check wiring continuity between positions no. N and no. dd of the electrical box connector. The wire position of the electrical box connector should also be checked. The BLACK/YELLOW wire from the MPEM is in position no. dd, and the BLACK wire, also from the MPEM, is in position no. N.

If the DESS system is not working, you can check the DESS wire as follow. Disconnect the connector behind dashboard. Measure the resistance between center post terminal and the WHITE/GREY wire. The reading should not be greater than 1 MΩ. Otherwise replace DESS post. The DESS system can be diagnosed with the beep codes.

NOTE : If DESS post removal is required, use the safety lanyard post tool (P/N 295 000 121).

Start/Stop Switch

The start/stop switch's configuration is a SPST NO (Single Pole, Single Throw, Normally Open) type. This means that the contact is open when the switch is not pressed. It is necessary to disconnect the switch connectors behind the dashboard to check the switch condition.

Take a resistance reading at the switch's terminals. When the switch is not pressed, resistance should be infinite. When the switch is activated, resistance should not exceed 1 Ω.

With the switch disconnected, check voltage in the harness where the switch is connected. Safety lanyard must be on DESS post. To do so, connect voltmeter's positive test probe to position A of weather pack. Voltmeter's negative test probe is connected to position B of weather pack. The voltmeter reading should be about 12 Vdc (battery voltage). If such is not the case, do as follows:

1. Disconnect harness from electrical box.
2. Using a voltmeter, take a reading between positions no. ee and no. 1 of the box connector. (On Speedster, work with additional no. ff and no. 1 for port side (LH)). The reading must be 12 Vdc. If such is the case, the problem is related to the harness. Consequently, check the continuity of wire no. ee (additional no. ff for port side (LH) of Speedster).

   Unplug the connector from the fuse block (in front storage compartment). Check the wire continuity at position no. 6 (additional no. 7 for port side (LH) of Speedster).
3. If problem originates from the electrical box, check the condition of the MPEM supply fuse (2 on Speedster). Also check the wire condition in positions no. ee and no. 1 of connector (additional no. ff and no. 1 for port side (LH) of Speedster).
4. If the start/stop switch still does not work, the MPEM can be suspected.

All models except Challenger

If the STOP function of the start/stop switch does not work, it is necessary to check if engine runs over 1000 RPM. If it does so, check the BLACK/RED/GREEN wire connection (additional BLACK/RED wire for port side (LH) of Speedster). If this does not solve the problem, the MPEM is faulty.

Starting Solenoid Activation

All Models

When engine does not start, the second item to check, after the start/stop switch, is the starting solenoid activation. When the start/stop switch is pressed with safety lanyard on DESS post, MPEM solenoid outlet YELLOW/RED/GREEN wire (additional YELLOW/RED for port side (LH) of Speedster) is activated and it provides a 12 Vdc voltage. In order to check this circuit, it is necessary to disconnect connector from solenoid. Ensure that there is 12 Vdc at the connector's terminals when start/stop switch is activated. If not, the MPEM can be the cause.

If everything tests good, check starting solenoid. Refer to STARTING SYSTEM 08-07.

Neutral Switch

When shifter lever is in neutral position, the neutral switch is electrically closed. Take a resistance reading at the switch's terminals. First remove connectors from switch. When the switch is not pressed, resistance should be infinite. When the switch is activated, resistance should not exceed 1 Ω. Reinstall connectors.

The MPEM's neutral inlet corresponds to RED/WHITE wire in position no. aa of electrical box connector. To check harness, disconnect it from the electrical box. Ensure wire continuity between positions no. aa and no. 1 of connector when shifter is in neutral. Also ensure that BLACK wire, in position no. 1, is perfectly grounded. Unplug the large connector from the fuse block (in front storage compartment). Check continuity of wire at position no. 5. If the problem is not solved, replace the MPEM.

NOTE : Vibration can cause a malfunction of the neutral position switch. Indeed, vibration causes contacts to shut off, which may bring about the engine not to run over 3500 RPM.

RPM Limiter

All Models Except Challenger

If maximum engine's speed is not limited to 7000 RPM, check the connection of BLACK/RED/GREEN wire (additional BLACK/RED wire for port (LH) side of Speedster). Otherwise, replace the MPEM.

Challenger Only

If maximum engine's speed is not limited to 3500 in neutral, first ensure the neutral switch is properly working (see farther in this section). Proceed as follows if it tested good.

If maximum engine's speed is not limited to 7200 in forward or reverse, the DC-CDI module can be suspected. Try a known good one. If it does not solve the problem, the MPEM module can be suspected. Try a known good one.

Keep in mind that the RPM limiter device is inside the DC-CDI module but it is controlled by the MPEM.

Gauge Supply Outlet

Gauge supply, as well as beeper supply, come from the MPEM via a relay. If this outlet malfunctions, check the gauge fuse (on MPEM) first.

Measure the voltage between the gauge outlet and a ground (ensure ground is perfect). It should be 12 Vdc. Otherwise, the MPEM is faulty (possibly the gauge relay).

If gauge outlet supplies 12 Vdc, check the wire position of PURPLE, PURPLE/TAN and PURPLE/GREY wires in the electrical box connector (see wiring diagram). To check harness, disconnect it from electrical box. Check continuity between ends of wires (see wiring diagram).

Monitoring Beeper

If beeper does not emit diagnostic codes anymore, while the MPEM gauge supply outlet works, check if beeper functions well, as follows:

1. Access 33-second temporization mode.
2. Disconnect engine overheating sensor wire (any wire on Speedster).
3. Ground the disconnected wire.
4. Beeper should be functional. Otherwise, check wiring harness. Also check the beeper by supplying an external 12 Vdc directly to its harness. Polarity is mandatory. Connect the positive supply wire to the PURPLE/TAN wire.

Overheat Sensor

In order to check the engine's overheat sensor wires, proceed as for beeper.

Accessories

If an accessory does not work, first check accessory fuse (on MPEM). It is also possible to check the operation of an accessory by connecting it directly to an external 12 Vdc source. Unplug the 2-wire connector from the fuse block (in front storage compartment). Check the voltage with the meter + probe connected to the RED wire and the – probe to the BLACK wire. The voltage should be of 12 Vdc. If there is no voltage, check the separate 20 A fuse in the electrical box (engine compartment).

If everything above is good, disconnect the large connector from the fuse block. Using a voltmeter, take a reading of the fuse block outlet corresponding with the faulty accessory (see chart below).

ACCESSORY	COLOR	VOLTMETER TEST PROBE +	VOLTMETER TEST PROBE –
Pump	BROWN/ ORANGE	Connector's pin no. 21	Ground
Nav/Anc	GREY/ ORANGE	Connector's pin no. 18	Ground
Auxiliary supply (for additional accessory	ORANGE	Connector's pin no. 16	Ground
Blower	YELLOW/ ORANGE	Connector's pin no. 17	Ground

If there is voltage at the fuse block outlet, problem originates from harness. Check connector wire position, as well as wires continuity in the harness. Refer to wiring diagram.

Switches can be checked using an ohmmeter. When switch is activated, resistance should be below 1 Ω. When switch is deactivated, resistance should be infinite. The following chart shows switch connections for each accessory.

ACCESSORY SWITCH	TYPE	COUNTER CLOCKWISE	CENTER	CLOCKWISE
Blower	On/Off	NONE	OFF	ON B1-L1 closed
Bilge Pump	On/Off	NONE	OFF	ON B1-L1 closed
Nav/Anc	L2 : On/Off L1 & L2 : On	ON B1-L2 closed	OFF	ON B1-L1-L2 closed

NOTE : B1, B2, L1, and L2 represent the identification of the switch tabs.

Charging System

MPEM's RED/GREEN wire (additional RED wire for port (LH) side of **Speedster**) with a female bullet is linked to regulator/rectifier. It allows to charge the battery when the engine runs. If the charging system does not work, check charging system fuse then RED/GREEN wire connection. For testing procedures, refer to CHARGING SYSTEM 08-07.

INSTRUMENTS AND ACCESSORIES

Water Sensor

Before beginning to check automatic pump circuit, ensure that pump operates correctly in manual mode.

To check circuit, jump 2 sensor poles (2 star screws) using a wire in order to simulate the presence of water. Sensor poles must be connected for about 10 seconds for pump to start. When poles are disconnected, pump will take about 25 seconds to stop.

1. If pump does not work with the above test, check bilge pump fuse and fuse block power supply fuse located in electrical box. Unplug 23-hole connector from fuse block (located in front storage compartment, under basket), disconnect sensor, and check continuity in wire no. 31 and no. 32 separately. If continuity is good, skip to following test. If not good, replace wires linking fuse block with sensor.

While sensor is disconnected, ensure that each wire is connected to a pole. If continuity is good, fuse block can be suspected. If not good, replace sensor.

2. If pump operates continuously, check that pump manual switch works correctly. If not, replace switch.

Disconnect sensor, and using an ohmmeter, measure resistance between 2 sensor wires. It must be over 40 KΩ. If sensor resistance is below 40 KΩ, clean sensor and recheck. If test still fails, replace sensor. If sensor resistance is over 40 KΩ, unplug 23-hole connector from fuse block, disconnect sensor, and using an ohmmeter measure resistance between wire no. 31 and no. 32 separately. Resistance should be infinite. If not, replace wires no. 31 and no. 32. If test still fails, fuse block can be suspected.

WIRING DIAGRAMS

HOW TO USE THE TABLES WITH THE SCHEMATIC DIAGRAMS

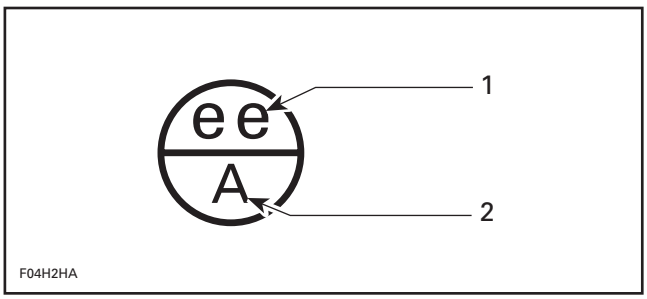
The following refer to the column titles in the tables.

SEQ

This number gives a common reference to an electrical circuit whatever the vehicle it is used on. For instance the number 1 is used for the overheat sensor on Speedster/Sportster and Challenger models.

Wire Identification

This is the "name" of a wire. It identifies the various wires. It can be a letter or a number. The wire identification given in the schematic diagram is inside a circle. The upper half gives the wire "name" while the lower half gives the identification of the wire end. End "A" and end "B" are used.



1. Wire identification
2. End of wire identification

Wire Color

It identifies the color of a wire. When a 2-color scheme is used, the first color is the main color while the second color is the tracer color.

Circuit

This is the electrical circuit that matches the wire, connector etc.

Connector

This is the connector to which the wire is connected. (Refer to connector identification following each table.)

Wire Position In Connector

This is the wire position in the connector. The number or letter given refers to the physical identification stamped on the connector.

From And To

This gives connections of both ends for a wire.

MAIN WIRING HARNESS CONNECTIONS FOR **SPEEDSTER**

SEQ	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	CONNECTOR	WIRE POSITION IN CONNECTOR	CONNECTOR	WIRE POSITION IN CONNECTOR
				FROM		**TO**	
1	A	TAN	Overheat Sensor (LH)	C01	A	C30B	
2	B	TAN/GREEN	Overheat Sensor (RH)	C01	B	C30A	
3	C	BLACK	Magneto, ignition system generator coil ground (RH)	C01	C	C31A	2
4	D	BLACK/RED/ GREEN	Magneto, RPM limiter wire/ignition system generator coil (RH)	C01	D	C31A	1
5	E						
6	F	YELLOW/BLACK/ GREEN	Magneto, charging system generator coil (RH)	C01	F	C31A	3
7	G	YELLOW/GREEN	Magneto, charging system generator coil (RH)	C01	G	C31A	4
8	H	PURPLE/GREY	Tachometer supply (LH)	C01	H	C19B	A
9	J	PURPLE/GREY	Tachometer supply (RH)	C01	J	C19A	A
10	K	PURPLE/TAN	Speedometer supply	C01	K	C21	A
11	L	PURPLE/TAN	Overheating beeper supply	C01	L	C02	A
12	M	PURPLE	Fuel/oil gauge supply	C01	M	C17	A
13	N	BLACK	DESS (Digitally Encoded Security System) (ground)	C01	N	C03	B
14	P						
15	R	BLACK/RED	Magneto, RPM limiter wire/ignition system generator coil (LH)	C01	R	C31B	1
16	S	BLACK	Magneto, ignition system generator coil ground (LH)	C01	S	C31B	2
17	T	YELLOW/BLACK	Magneto, charging system generator coil (LH)	C01	T	C31B	3
18	U	YELLOW	Magneto, charging system generator coil (LH)	C01	U	C31B	4
19	V	GREY	Tachometer RPM signal wire (LH)	C01	V	C18B	A
20	W	GREY/GREEN	Tachometer RPM signal wire (RH)	C01	W	C18A	A
21	aa	RED/WHITE	Neutral switch supply	C01	aa	C20	2
22	bb	TAN/BLACK	Monitoring beeper ground	C01	bb	C02	B
23	cc	WHITE/GREY	DESS post (DESS recognition)	C01	cc	C03	A
24	dd	BLACK/YELLOW	DESS (Digitally Encoded Security System) (cut-out)	C01	dd	C03	C
25	ee	YELLOW/RED/ GREEN	Start/stop switch supply (RH)	C01	ee	C06A	A
26	ff	YELLOW/RED	Start/stop switch supply (LH)	C01	ff	C06B	A
27	gg						
28	hh						
29	1	BLACK	Fuse block ground	C01	1	C15	B
30	2						
31	3	RED	Fuse block supply	C01	3	C15	A
32	4						
33	17	BLACK	Bow light ground	C04		C16	23
34	16	GREY	Bow light supply	C05		C13	
35	24	BLACK	Start/stop switch ground (RH)	C06A	B	C16	6
36	20	BROWN/ORANGE	Bilge pump switch	C07		C16	21
37	21	BROWN	Bilge pump switch	C08		C16	14
38	10	YELLOW/ORANGE	Blower switch	C09		C16	17
39	11	YELLOW	Blower supply	C10		C23	A
40	13	GREY/ORANGE	Nav/anc light switch supply	C11		C16	18
41	14	GREY/BLACK	Stern light	C12		C24	A
42	19	BLACK	Auxiliary supply (ground)	C14	B	C16	13
43	18	ORANGE	Auxiliary supply	C14	A	C16	16
44	23	BLACK	Bilge pump ground	C16	1	C27	A

MAIN WIRING HARNESS CONNECTIONS FOR **SPEEDSTER**

SEQ	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	CONNECTOR	WIRE POSITION IN CONNECTOR	CONNECTOR	WIRE POSITION IN CONNECTOR
				FROM		**TO**	
45	12	BLACK	Blower ground	C16	2	C23	B
46	30	BLACK/GREY	Tachometer ground (RH)	C16	3	C19A	B
47	29	BLACK	Neutral switch ground	C16	5	C20	1
48	9	BLACK	Gauge supply (ground)	C16	11	C17	B
49	28	BLACK/TAN	Speedometer ground	C16	12	C21	B
50	15	BLACK	Stern light ground	C16	15	C24	B
51	31	WHITE/BROWN	Water sensor	C16	19	C26	B
52	32	WHITE/BROWN	Water sensor	C16	20	C26	A
53	22	BROWN	Bilge pump	C16	22	C27	B
54	8	PINK	Fuel level sensor	C17	C	C28	B
55	7	PINK/BLACK	Fuel level sensor	C17	D	C28	A
56	6	WHITE	Oil level sensor	C17	E	C29	A
57	5	BLUE/BLACK	Oil level sensor	C17	F	C29	B
58	27	BLUE/PURPLE	Speedometer sensor	C22	A	C25	A
59	26	PURPLE/YELLOW	Speedometer sensor	C22	B	C25	B
60	25	BLACK (shield)	Speedometer sensor	C22	C	C25	C
61	34	BLACK	Start/stop switch ground (LH)	C06B	B	C16	7
62	33	BLACK/GREY	Tachometer ground (LH)	C16	4	C19B	B

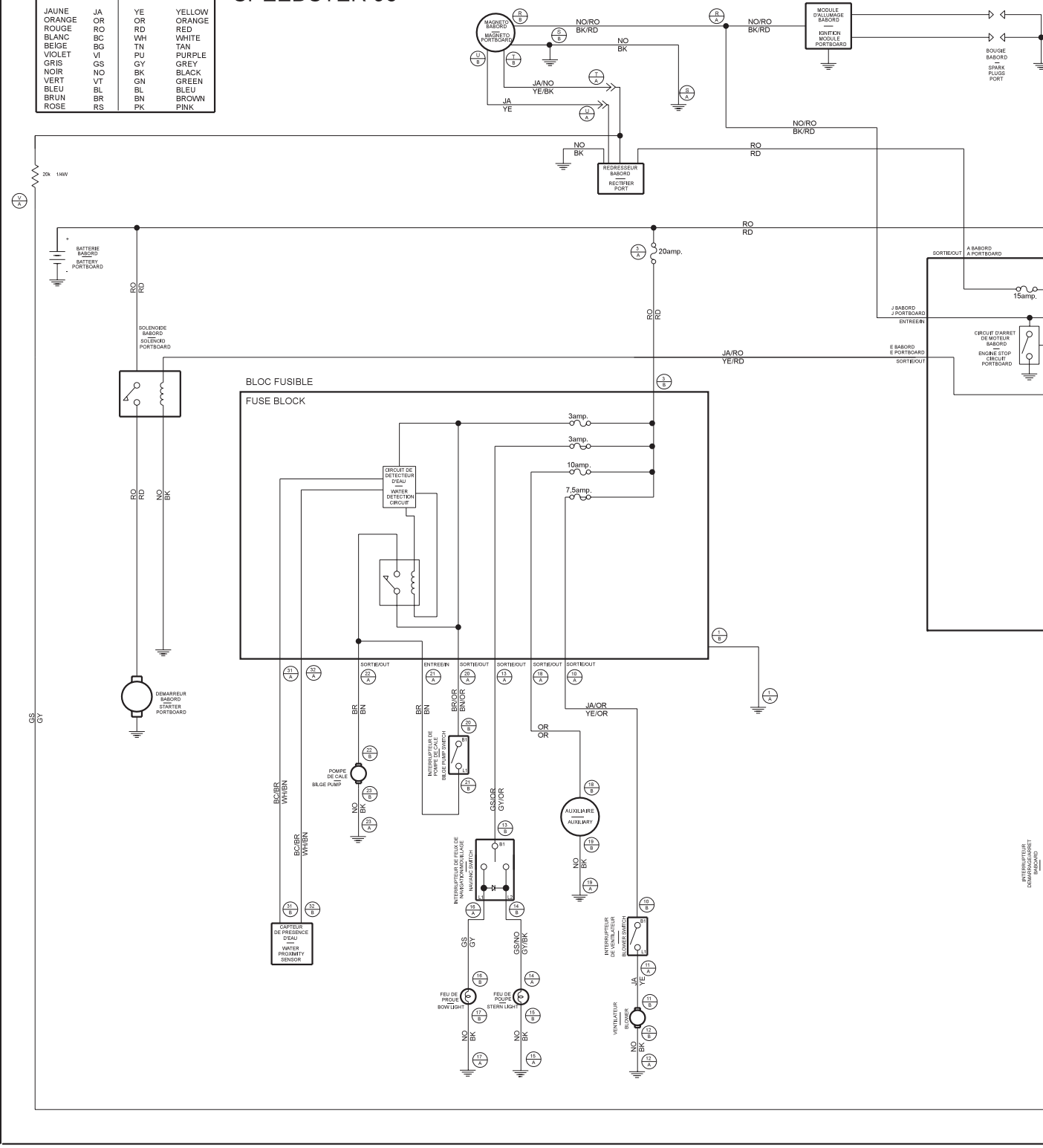
CONNECTOR LOCATION

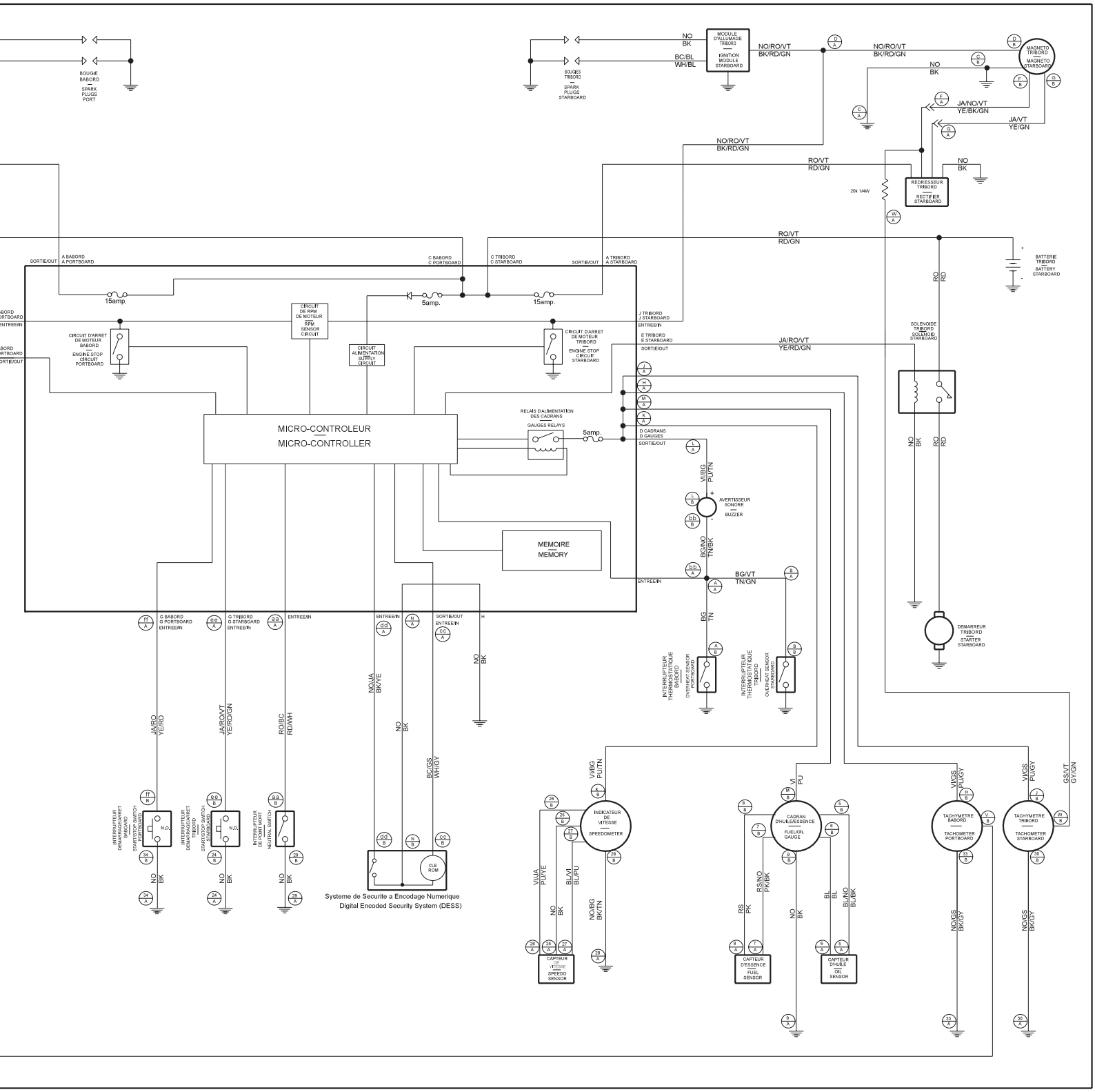
C01: ITT CANNON on side of electrical box
C02: Inside front storage compartment
C03: Behind dashboard
C04: On bow lamp
C05: On bow lamp
C06A: Behind dashboard
C06B: Behind dashboard
C07: Behind dashboard
C08: Behind dashboard
C09: Behind dashboard
C10: Behind dashboard
C11: Behind dashboard
C12: Behind dashboard
C13: Behind dashboard
C14: Behind dashboard
C15: Inside front storage compartment
C16: Inside front storage compartment, on fuse block
C17: Inside front storage compartment
C18A: Inside front storage compartment
C18B: Inside front storage compartment
C19A: Inside front storage compartment
C19B: Inside front storage compartment
C20: Close to shifter controller
C21: Inside front storage compartment
C22: Inside front storage compartment
C23: On blower (rear RH duct)
C24: On stern light
C25: On speedometer sensor on transom
C26: On water sensor close to bilge pump (rear portion of bilge)
C27: On bilge pump (rear portion of bilge)
C28: On fuel tank
C29: On oil tank
C30A: On RH engine (overheat sensor)
C30B: On LH engine (overheat sensor)
C31A: DEUTSCH, on RH engine
C31B: DEUTSCH, on LH engine

SPEEDSTER 5894

SPEEDSTER 96

CODE DE COULEUR / COLOR CODE			
JAUNE	JA	YE	YELLOW
ORANGE	OR	OR	ORANGE
ROUGE	RO	RD	RED
BLANC	BC	WH	WHITE
BEIGE	BG	TN	TAN
VIOLET	VI	PU	PURPLE
GRIS	GS	GY	GREY
NOIR	NO	BK	BLACK
VERT	VT	GN	GREEN
BLEU	BL	BL	BLEU
BRUN	BR	BN	BROWN
ROSE	RS	PK	PINK




BOUGIE BABORD — SPARK PLUGS PORT
BOUGIE TRIBORD — SPARK PLUGS STARBOARD
MODULE D'ALLUMAGE TRIBORD — IGNITION MODULE STARBOARD
NO BK
BC/BL WH/BL
NO/RO/VT BK/RD/GN
MAGNETO TRIBORD — MAGNETO STARBOARD
JA/NO/VT YE/BK/GN
JA/VT YE/GN
RO/VT RD/GN
REDRESSEUR TRIBORD — RECTIFIER STARBOARD
20k 1/4W
BATTERIE TRIBORD — BATTERY STARBOARD
SORTIE/OUT
A BABORD A PORTBOARD
C BABORD C PORTBOARD
C TRIBORD C STARBOARD
A TRIBORD A STARBOARD
15amp.
5amp.
CIRCUIT DE RPM DE MOTEUR — RPM SENSOR CIRCUIT
CIRCUIT ALIMENTATION — SUPPLY CIRCUIT
CIRCUIT D'ARRET DE MOTEUR BABORD — ENGINE STOP CIRCUIT PORTBOARD
CIRCUIT D'ARRET DE MOTEUR TRIBORD — ENGINE STOP CIRCUIT STARBOARD
J TRIBORD J STARBOARD
E TRIBORD E STARBOARD
ENTREE/IN
JA/RO/VT YE/RD/GN
SOLENOIDE TRIBORD — SOLENOID STARBOARD
MICRO-CONTROLEUR — MICRO-CONTROLLER
RELAIS D'ALIMENTATION DES CADRANS — GAUGES RELAYS
D CADRANS D GAUGES
MEMOIRE — MEMORY
VI/BG PU/TN
AVERTISSEUR SONORE — BUZZER
BG/NO TN/BK
BG/VT TN/GN
BG TN
DEMARREUR TRIBORD — STARTER STARBOARD
INTERRUPTEUR THERMOSTATIQUE BABORD — OVERHEAT SENSOR PORTBOARD
INTERRUPTEUR THERMOSTATIQUE TRIBORD — OVERHEAT SENSOR STARBOARD
G BABORD G PORTBOARD ENTREE/IN
G TRIBORD G STARBOARD ENTREE/IN
INTERRUPTEUR DEMARRAGE/ARRET NEUTRE — START/STOP SWITCH NEUTRAL
INTERRUPTEUR DEMARRAGE/ARRET TRIBORD — START/STOP SWITCH STARBOARD
INTERRUPTEUR DE NEUTRE — NEUTRAL SWITCH
JA/RO YE/RD
JA/ROVT YE/RD/GN
RO/BG RD/WH
NO/JA BK/YE
BC/GS WH/GY
CLE ROM
Systeme de Securite a Encodage Numerique
Digital Encoded Security System (DESS)
INDICATEUR DE VITESSE — SPEEDOMETER
CAPTEUR DE VITESSE — SPEEDO SENSOR
VI/JA PU/YE
BL/VI BL/PU
NO/BG BK/TN
CADRAN D'HUILE/ESSENCE — FUEL/OIL GAUGE
CAPTEUR D'ESSENCE — FUEL SENSOR
CAPTEUR D'HUILE — OIL SENSOR
RS/NO PK/BK
RS PK
BL BL
BU/NO BL/BK
TACHYMETRE BABORD — TACHOMETER PORTBOARD
TACHYMETRE TRIBORD — TACHOMETER STARBOARD
VI/GS PU/GY
GS/VT GY/GN
NO/GS BK/GY

MAIN WIRING HARNESS CONNECTIONS FOR **SPORTSTER**

SEQ	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	FROM CONNECTOR	FROM WIRE POSITION IN CONNECTOR	TO CONNECTOR	TO WIRE POSITION IN CONNECTOR
1	A						
2	B	TAN/GREEN	Overheat Sensor	C01	B	C30	
3	C	BLACK	Magneto, ignition system generator coil ground	C01	C	C31	2
4	D	BLACK/RED/ GREEN	Magneto, RPM limiter wire/ignition system generator coil	C01	D	C31	1
5	E						
6	F	YELLOW/BLACK/ GREEN	Magneto, charging system generator coil	C01	F	C31	3
7	G	YELLOW/GREEN	Magneto, charging system generator coil	C01	G	C31	4
8	H						
9	J	PURPLE/GREY	Tachometer supply	C01	J	C19	A
10	K	PURPLE/TAN	Speedometer supply	C01	K	C21	A
11	L	PURPLE/TAN	Overheating beeper supply	C01	L	C02	A
12	M	PURPLE	Fuel/oil gauge supply	C01	M	C17	A
13	N	BLACK	DESS (Digitally Encoded Security System) (ground)	C01	N	C03	B
14	P						
15	R						
16	S						
17	T						
18	U						
19	V						
20	W	GREY/GREEN	Tachometer RPM signal wire	C01	W	C18	A
21	aa	RED/WHITE	Neutral switch supply	C01	aa	C20	2
22	bb	TAN/BLACK	Monitoring beeper ground	C01	bb	C02	B
23	cc	WHITE/GREY	DESS post (DESS recognition)	C01	cc	C03	A
24	dd	BLACK/YELLOW	DESS (Digitally Encoded Security System) (cut-out)	C01	dd	C03	C
25	ee	YELLOW/RED/ GREEN	Start/stop switch supply	C01	ee	C06	A
26	ff						
27	gg						
28	hh						
29	1	BLACK	Fuse block ground	C01	1	C15	B
30	2						
31	3	RED	Fuse block supply	C01	3	C15	A
32	4						
33	17	BLACK	Bow light ground	C04		C16	23
34	16	GREY	Bow light supply	C05		C13	
35	24	BLACK	Start/stop switch ground	C06	B	C16	6
36	20	BROWN/ORANGE	Bilge pump switch	C07		C16	21
37	21	BROWN	Bilge pump switch	C08		C16	14
38	10	YELLOW/ORANGE	Blower switch	C09		C16	17
39	11	YELLOW	Blower supply	C10		C23	A
40	13	GREY/ORANGE	Nav/anc light switch supply	C11		C16	18
41	14	GREY/BLACK	Stern light	C12		C24	A
42	19	BLACK	Auxiliary supply (ground)	C14	B	C16	13
43	18	ORANGE	Auxiliary supply	C14	A	C16	16
44	23	BLACK	Bilge pump ground	C16	1	C27	A
45	12	BLACK	Blower ground	C16	2	C23	B
46	30	BLACK/GREY	Tachometer ground	C16	3	C19	B

MAIN WIRING HARNESS CONNECTIONS FOR **SPORTSTER**

SEQ	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	CONNECTOR	WIRE POSITION IN CONNECTOR	CONNECTOR	WIRE POSITION IN CONNECTOR
				FROM		**TO**	
47	29	BLACK	Neutral switch ground	C16	5	C20	1
48	9	BLACK	Gauge supply (ground)	C16	11	C17	B
49	28	BLACK/TAN	Speedometer ground	C16	12	C21	B
50	15	BLACK	Stern light ground	C16	15	C24	B
51	31	WHITE/BROWN	Water sensor	C16	19	C26	B
52	32	WHITE/BROWN	Water sensor	C16	20	C26	A
53	22	BROWN	Bilge pump	C16	22	C27	B
54	8	PINK	Fuel level sensor	C17	C	C28	B
55	7	PINK/BLACK	Fuel level sensor	C17	D	C28	A
56	6	WHITE	Oil level sensor	C17	E	C29	A
57	5	BLUE/BLACK	Oil level sensor	C17	F	C29	B
58	27	BLUE/PURPLE	Speedometer sensor	C22	A	C25	A
59	26	PURPLE/YELLOW	Speedometer sensor	C22	B	C25	B
60	25	BLACK (shield)	Speedometer sensor	C22	C	C25	C
61	34						
62	33						

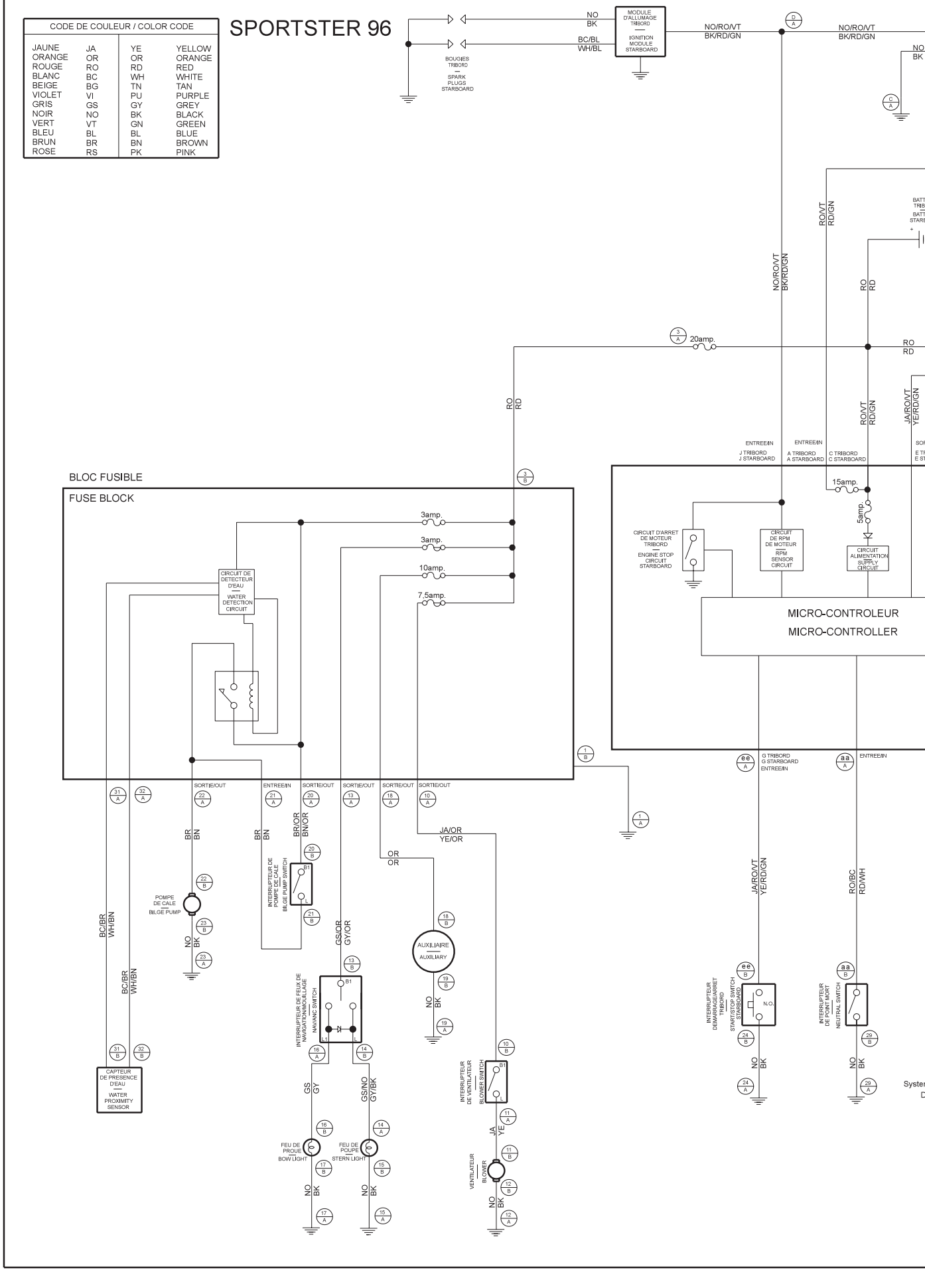
CONNECTOR LOCATION

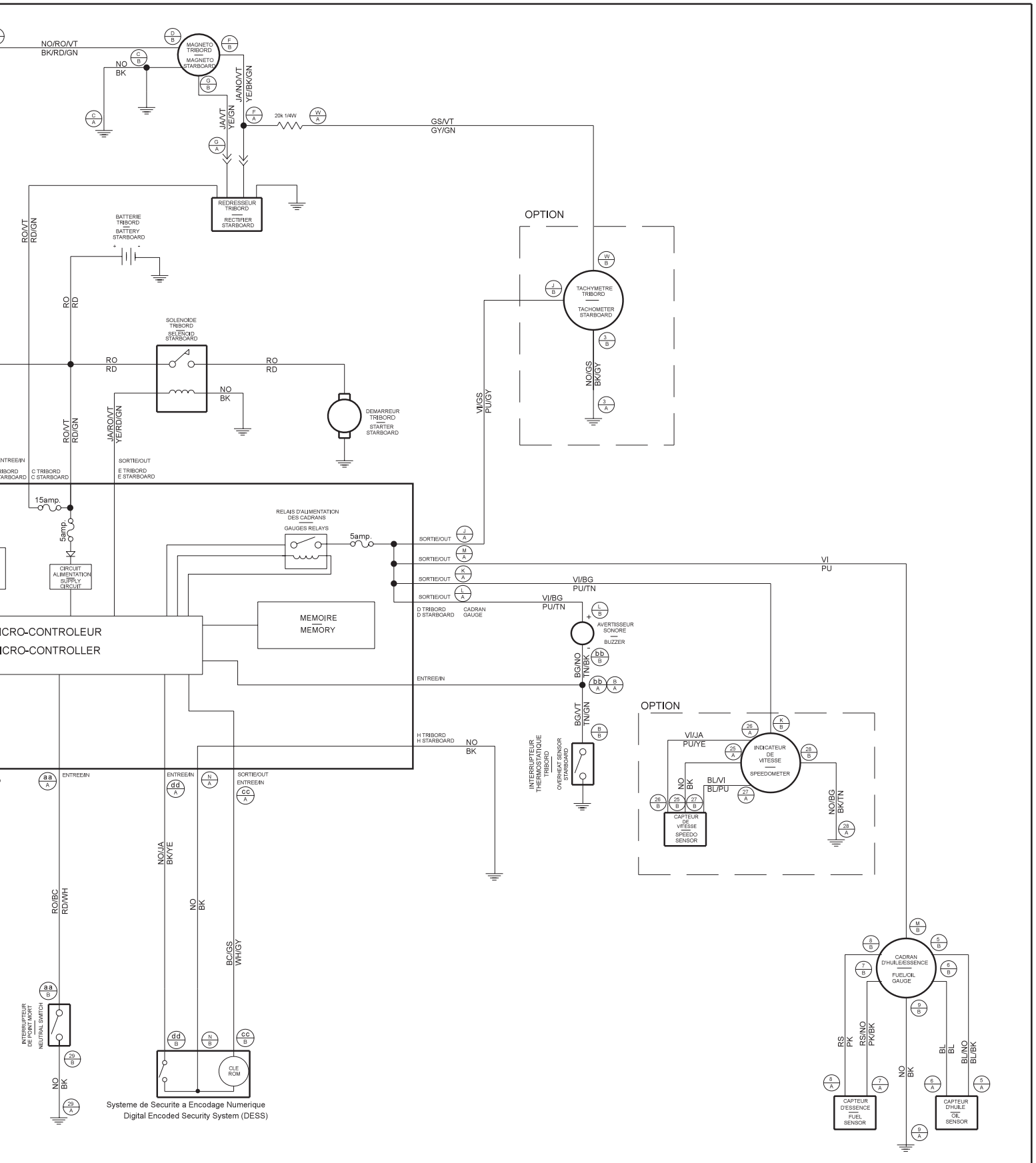
C01: ITT CANNON on side of electrical box
C02: Inside front storage compartment
C03: Behind dashboard
C04: On bow lamp
C05: On bow lamp
C06: Behind dashboard
C07: Behind dashboard
C08: Behind dashboard
C09: Behind dashboard
C10: Behind dashboard
C11: Behind dashboard
C12: Behind dashboard
C13: Behind dashboard
C14: Behind dashboard
C15: Inside front storage compartment
C16: Inside front storage compartment, on fuse block
C17: Inside front storage compartment
C18: Inside front storage compartment
C19: Inside front storage compartment
C20: Close to shifter controller
C21: Inside front storage compartment
C22: Inside front storage compartment
C23: On blower (rear RH duct)
C24: On sterrn light
C25: On speedometer sensor on transom
C26: On water sensor close to bilge pump (rear portion of bilge)
C27: On bilge pump (rear portion of bilge)
C28: On fuel tank
C29: On oil tank
C30: On engine (overheat sensor)
C31: DEUTSCH, on engine

SPORTSTER 5895

SPORTSTER 96

CODE DE COULEUR / COLOR CODE			
JAUNE	JA	YE	YELLOW
ORANGE	OR	OR	ORANGE
ROUGE	RO	RD	RED
BLANC	BC	WH	WHITE
BEIGE	BG	TN	TAN
VIOLET	VI	PU	PURPLE
GRIS	GS	GY	GREY
NOIR	NO	BK	BLACK
VERT	VT	GN	GREEN
BLEU	BL	BL	BLUE
BRUN	BR	BN	BROWN
ROSE	RS	PK	PINK




NO/RO/VT
BK/RD/GN
MAGNETO TRIBORD
MAGNETO STARBOARD
NO
BK
JA/NO/VT
YE/BK/GN
JA/VT
YE/GN
20k 1/4W
GS/VT
GY/GN
REDRESSEUR TRIBORD
RECTIFIER STARBOARD
BATTERIE TRIBORD
BATTERY STARBOARD
RO/VT
RD/GN
RO
RD
SOLENOIDE TRIBORD
SELENOID STARBOARD
DEMARREUR TRIBORD
STARTER STARBOARD
JA/RO/VT
YE/RD/GN
OPTION
TACHYMETRE TRIBORD
TACHOMETER STARBOARD
VI/GS
PU/GY
NO/GS
BK/GY
ENTREE/IN
C TRIBORD
C STARBOARD
SORTIE/OUT
E TRIBORD
E STARBOARD
15amp.
5amp.
CIRCUIT ALIMENTATION
SUPPLY CIRCUIT
RELAIS D'ALIMENTATION DES CADRANS
GAUGES RELAYS
SORTIE/OUT
D TRIBORD
D STARBOARD
CADRAN
GAUGE
VI
PU
VI/BG
PU/TN
AVERTISSEUR SONORE
BUZZER
BG/NO
TN/BK
ENTREE/IN
MEMOIRE
MEMORY
ICRO-CONTROLEUR
ICRO-CONTROLLER
BG/VT
TN/GN
H TRIBORD
H STARBOARD
NO
BK
INTERRUPTEUR THERMOSTATIQUE TRIBORD
OVERHEAT SENSOR STARBOARD
OPTION
VI/JA
PU/YE
INDICATEUR DE VITESSE
SPEEDOMETER
BL/VI
BL/PU
NO/BG
BK/TN
CAPTEUR DE VITESSE
SPEEDO SENSOR
ENTREE/IN
SORTIE/OUT
ENTREE/IN
NO/JA
BK/YE
NO
BK
BC/GS
WH/GY
RO/BC
RD/WH
INTERRUPTEUR DE POINT MORT
NEUTRAL SWITCH
CLE ROM
Systeme de Securite a Encodage Numerique
Digital Encoded Security System (DESS)
CADRAN D'HUILE/ESSENCE
FUEL/OIL GAUGE
RS
PK
RS/NO
PK/BK
BL
BL
BL/NO
BL/BK
NO
BK
CAPTEUR D'ESSENCE
FUEL SENSOR
CAPTEUR D'HUILE
OIL SENSOR

MAIN WIRING HARNESS CONNECTIONS FOR **CHALLENGER**

SEQ.	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	CONNECTOR	WIRE POSITION IN CONNECTOR	CONNECTOR	WIRE POSITION IN CONNECTOR
				FROM		**TO**	
1	A						
2	B	TAN/GREEN	Overheat Sensor	C01	B	C30	
3	C	BLACK	Magneto, ignition system generator coil ground	C01	C	C31	4
4	D	YELLOW/WHITE/ GREEN	Magneto, RPM limiter wire/ignition system generator coil	C01	D	C31	5
5	E	YELLOW/GREEN	Magneto	C01	E	C31	3
6	F	YELLOW/GREEN	Magneto, charging system generator coil	C01	F	C31	2
7	G	YELLOW/GREEN	Magneto, charging system generator coil	C01	G	C31	1
8	H						
9	J	PURPLE/GREY	Tachometer supply	C01	J	C19	A
10	K	PURPLE/TAN	Speedometer supply	C01	K	C21	A
11	L	PURPLE/TAN	Overheating beeper supply	C01	L	C02	A
12	M	PURPLE	Fuel/oil gauge supply	C01	M	C17	A
13	N	BLACK	DESS (Digitally Encoded Security System) (ground)	C01	N	C03	B
14	P						
15	R						
16	S						
17	T						
18	U						
19	V						
20	W	GREY/GREEN	Tachometer RPM signal wire	C01	W	C18	A
21	aa	RED/WHITE	Neutral switch supply	C01	aa	C20	2
22	bb	TAN/BLACK	Monitoring beeper ground	C01	bb	C02	B
23	cc	WHITE/GREY	DESS post (DESS recognition)	C01	cc	C03	A
24	dd	BLACK/YELLOW	DESS (Digitally Encoded Security System) (cut-out)	C01	dd	C03	C
25	ee	YELLOW/RED/ GREEN	Start/stop switch supply	C01	ee	C06	A
26	ff						
27	gg						
28	hh	BLACK	Magneto	C01	hh	C31	6
29	1	BLACK	Fuse block ground	C01	1	C15	B
30	2						
31	3	RED	Fuse block supply	C01	2	C15	A
32	4						
33	17	BLACK	Bow light ground	C04		C16	23
34	16	GREY	Bow light supply	C05		C13	
35	24	BLACK	Start/stop switch ground	C06	B	C16	6
36	20	BROWN/ORANGE	Bilge pump switch	C07		C16	21
37	21	BROWN	Bilge pump switch	C08		C16	14
38	10	YELLOW/ORANGE	Blower switch	C09		C16	17
39	11	YELLOW	Blower supply	C10		C23	A
40	13	GREY/ORANGE	Nav/anc light switch supply	C11		C16	18
41	14	GREY/BLACK	Stern light	C12		C24	A
42	19	BLACK	Auxiliary supply (ground)	C14	B	C16	13
43	18	ORANGE	Auxiliary supply	C14	A	C16	16
44	23	BLACK	Bilge pump ground	C16	1	C27	A
45	12	BLACK	Blower ground	C16	2	C23	B
46	30	BLACK/GREY	Tachometer ground	C16	3	C19	B
47	29	BLACK	Neutral switch ground	C16	5	C20	1

MAIN WIRING HARNESS CONNECTIONS FOR **CHALLENGER**

SEQ	WIRE IDENTIFICATION	WIRE COLOR	CIRCUIT	CONNECTOR	WIRE POSITION IN CONNECTOR	CONNECTOR	WIRE POSITION IN CONNECTOR
				FROM		**TO**	
48	9	BLACK	Gauge supply (ground)	C16	11	C17	B
49	28	BLACK/TAN	Speedometer ground	C16	12	C21	B
50	15	BLACK	Stern light ground	C16	15	C24	B
51	31	WHITE/BROWN	Water sensor	C16	19	C26	B
52	32	WHITE/BROWN	Water sensor	C16	20	C26	A
53	22	BROWN	Bilge pump	C16	22	C27	B
54	8	PINK	Fuel level sensor	C17	C	C28	B
55	7	PINK/BLACK	Fuel level sensor	C17	D	C28	A
56	6	BLUE	Oil level sensor	C17	E	C29	A
57	5	BLUE/BLACK	Oil level sensor	C17	F	C29	B
58	27	BLUE/PURPLE	Speedometer sensor	C22	A	C25	A
59	26	PURPLE/YELLOW	Speedometer sensor	C22	B	C25	B
60	25	BLACK (shield)	Speedometer sensor	C22	C	C25	C

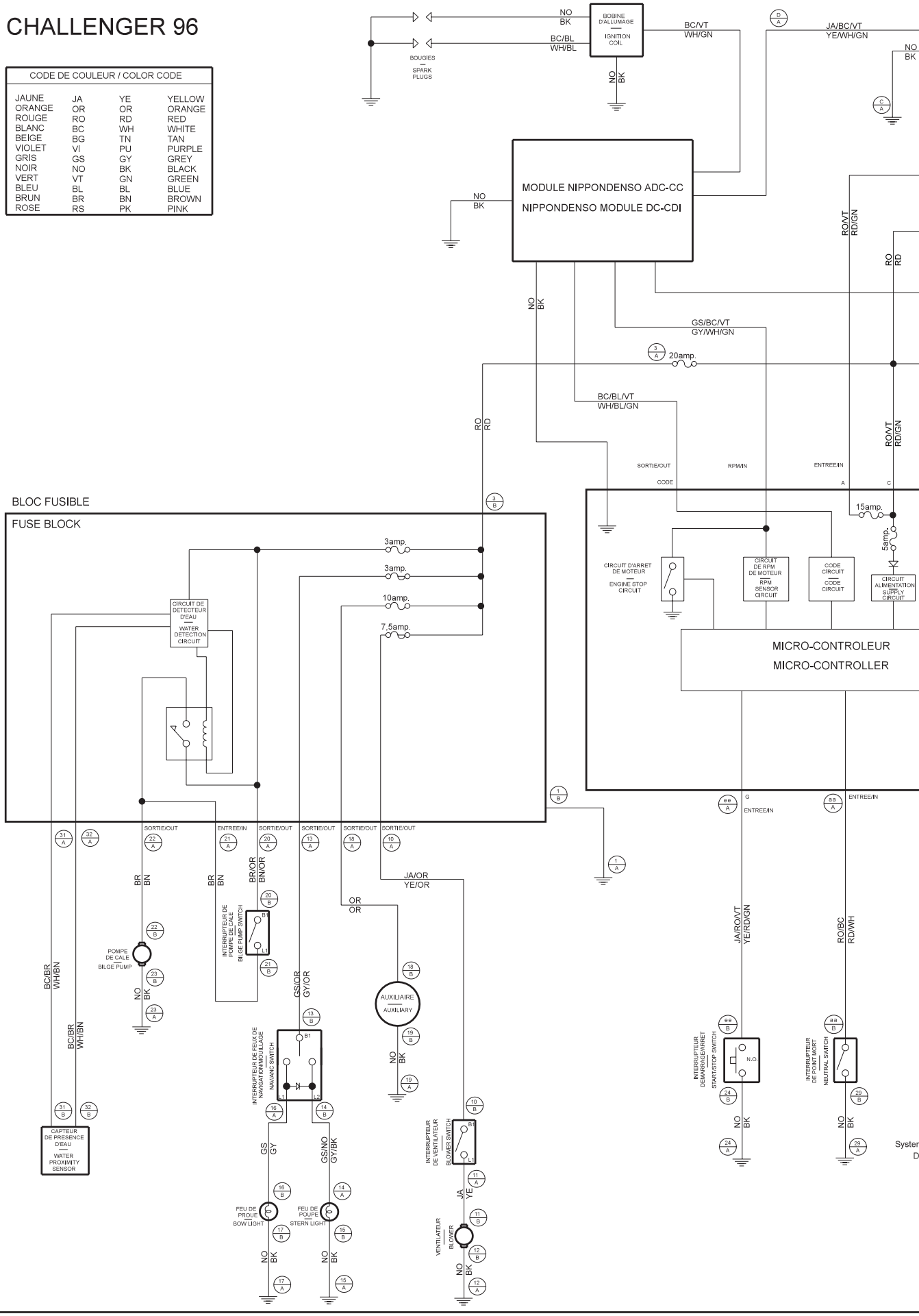
CONNECTOR LOCATION

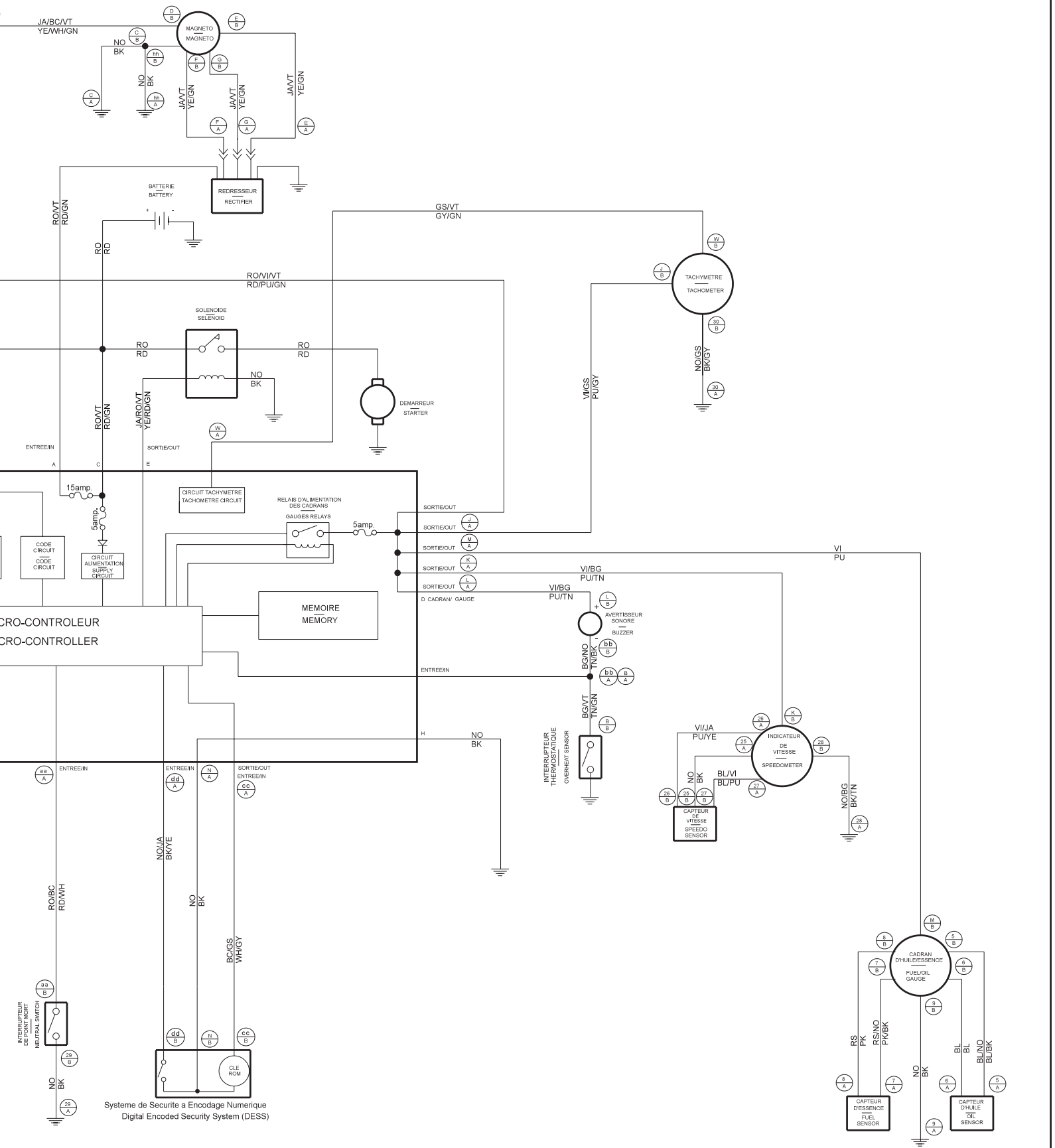
C01: ITT CANNON on side of electrical box
C02: Inside front storage compartment
C03: Behind dashboard
C04: On bow lamp
C05: On bow lamp
C06: Behind dashboard
C07: Behind dashboard
C08: Behind dashboard
C09: Behind dashboard
C10: Behind dashboard
C11: Behind dashboard
C12: Behind dashboard
C13: Behind dashboard
C14: Behind dashboard
C15: Inside front storage compartment
C16: Inside front storage compartment, on fuse block
C17: Inside front storage compartment
C18: Inside front storage compartment
C19: Inside front storage compartment
C20: Close to shifter controller
C21: Inside front storage compartment
C22: Inside front storage compartment
C23: On blower (rear RH duct)
C24: On sterrn light
C25: On speedometer sensor on transom
C26: On water sensor close to bilge pump (rear portion of bilge)
C27: On bilge pump (rear portion of bilge)
C28: On fuel tank
C29: On oil tank
C30: On engine (overheat sensor)
C31: DEUTSCH, on engine

CHALLENGER 5896

CHALLENGER 96

CODE DE COULEUR / COLOR CODE			
JAUNE	JA	YE	YELLOW
ORANGE	OR	OR	ORANGE
ROUGE	RO	RD	RED
BLANC	BC	WH	WHITE
BEIGE	BG	TN	TAN
VIOLET	VI	PU	PURPLE
GRIS	GS	GY	GREY
NOIR	NO	BK	BLACK
VERT	VT	GN	GREEN
BLEU	BL	BL	BLUE
BRUN	BR	BN	BROWN
ROSE	RS	PK	PINK



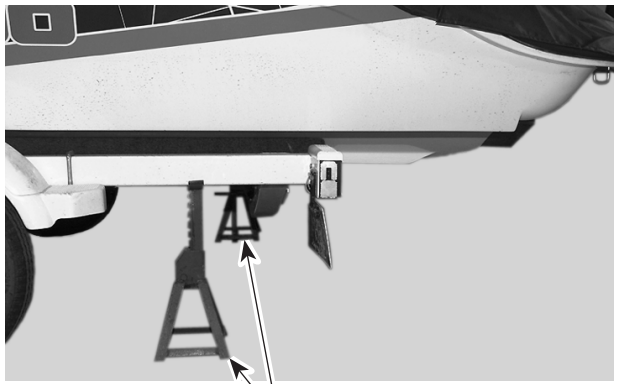

JA/BC/VT
YE/WH/GN
MAGNETO
MAGNETO
NO
BK
JA/VT
YE/GN
BATTERIE
BATTERY
REDRESSEUR
RECTIFIER
RO/VT
RD/GN
RO
RD
GS/VT
GY/GN
TACHYMETRE
TACHOMETER
RO/VI/VT
RD/PU/GN
SOLENOIDE
SELENOID
NO/GS
BK/GY
VI/GS
PU/GY
DEMARREUR
STARTER
JA/RO/VT
YE/RD/GN
ENTREE/IN
SORTIE/OUT
15amp.
5amp.
CIRCUIT TACHYMETRE
TACHOMETRE CIRCUIT
RELAIS D'ALIMENTATION
DES CADRANS
GAUGES RELAYS
CODE
CIRCUIT
CIRCUIT
ALIMENTATION
SUPPLY
CIRCUIT
D CADRAN/ GAUGE
VI
PU
VI/BG
PU/TN
AVERTISSEUR
SONORE
BUZZER
BG/NO
TN/BK
MEMOIRE
MEMORY
CRO-CONTROLEUR
CRO-CONTROLLER
BG/VT
TN/GN
INTERRUPTEUR
THERMOSTATIQUE
OVEN/HEAT SENSOR
VI/JA
PU/YE
INDICATEUR
DE
VITESSE
SPEEDOMETER
BL/VI
BL/PU
NO/BG
BK/TN
CAPTEUR
DE
VITESSE
SPEEDO
SENSOR
RO/BC
RD/WH
NO/JA
BK/YE
BC/GS
WH/GY
INTERRUPTEUR
DE POINT MORT
NEUTRAL SWITCH
CLE
ROM
Systeme de Securite a Encodage Numerique
Digital Encoded Security System (DESS)
CADRAN
D'HUILE/ESSENCE
FUEL/OIL
GAUGE
RS
PK
RS/NO
PK/BK
BL
BL
BL/NO
BL/BK
CAPTEUR
D'ESSENCE
FUEL
SENSOR
CAPTEUR
D'HUILE
OIL
SENSOR

PROPULSION AND DRIVE SYSTEMS

RIDE SHOE REMOVAL

All Models

To provide access for removing ride shoe(s), lift bow and partially slide boat off back of trailer. Lower bow, then support trailer as shown.



F04L2DB

1. Trailer supported with jack stands and wheels blocked

Disconnect battery cables. To prevent engine starting.

◆ WARNING

Always disconnect battery cables in the specified order. Disconnect BLACK ground cable first, then RED positive cable last.

Speedster Model

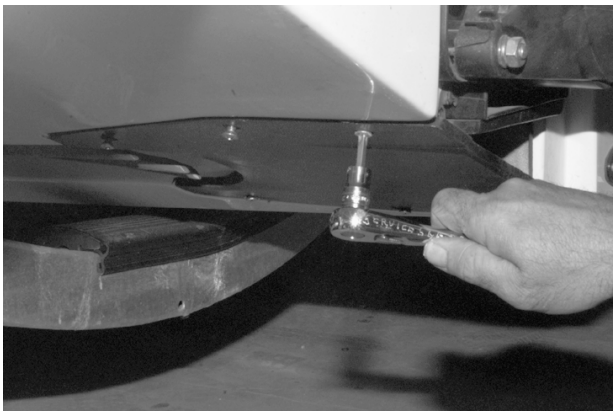
Tools Required

– 2 pry bars, approx. 46cm (19 in) in length
– Phillips head screwdriver
– Hammer
– Scraper

NOTE: Jet pump assembly does not need to be removed.

NOTE: Remove one ride shoe at a time.

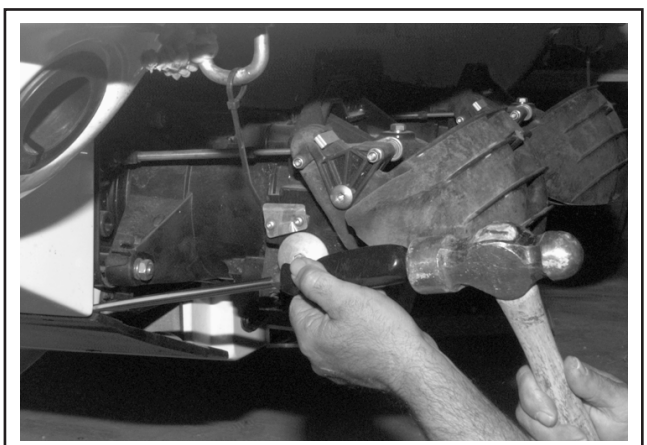
Remove six screws that are retaining ride shoe to hull.


F04L4UA

NOTE: It is not necessary to heat ride shoe in order to remove.

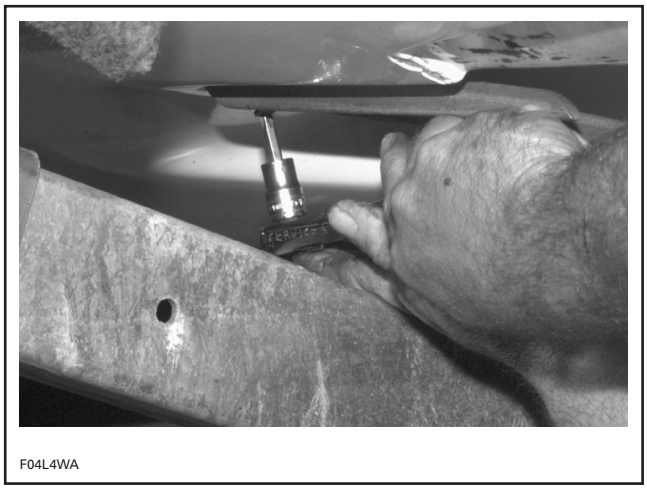
Insert pry bars between hull and ride shoe.

Tap ends of pry bars gently and alternately until the sealant bond breaks.


F04L4VA

Apply a slight downward pressure on pry bars until Ultra-Black seal releases and ride shoe separates from boat.

Unscrew two screws that are retaining intake grate.

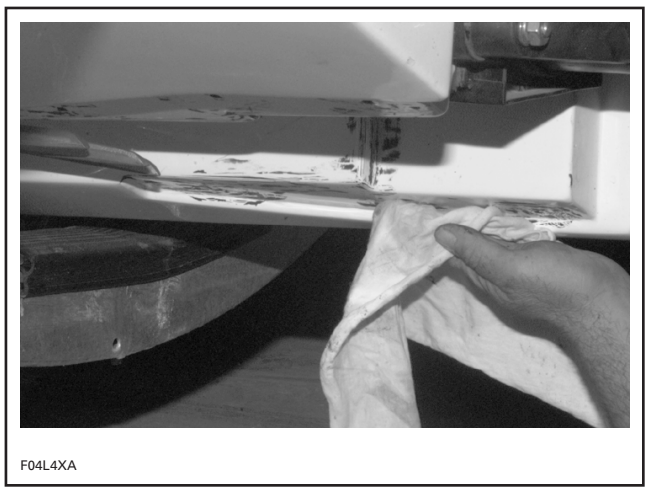


F04L4WA

Using a pry bar, apply a slight downward pressure in order for the intake grate to release from hull.

Scrape all excess Ultra-Black from ride shoe, intake grate and hull.

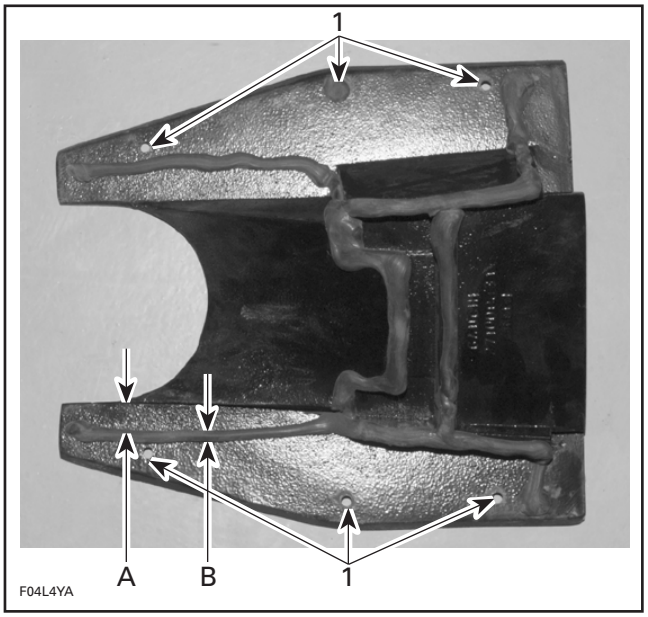
Clean ride shoe, intake grate and hull using acetone. Ensure to eliminate grease, dust and any remaining loose Ultra-Black sealant.



F04L4XA

Apply paint to any unpainted/scraped surfaces using PPG paint, black 9551. This will prevent corrosion.

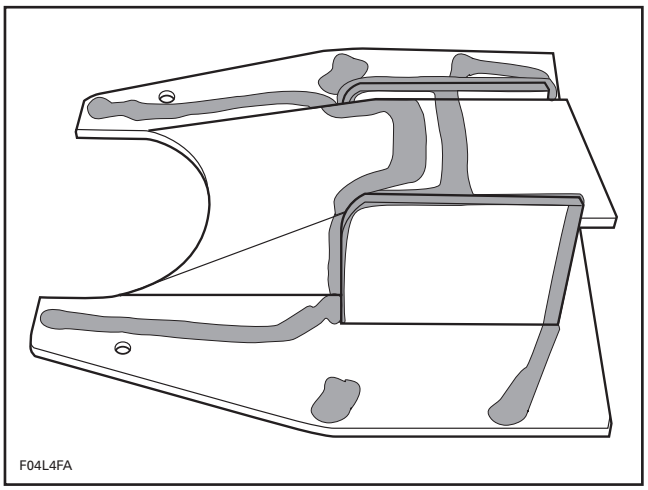
Apply a 6 mm (1/4 in) thick bead of Loctite Ultra-Black HB sealant (P/N 293 800 028) on ride shoe while paying close attention to the routing shown on the following illustrations.



F04L4YA

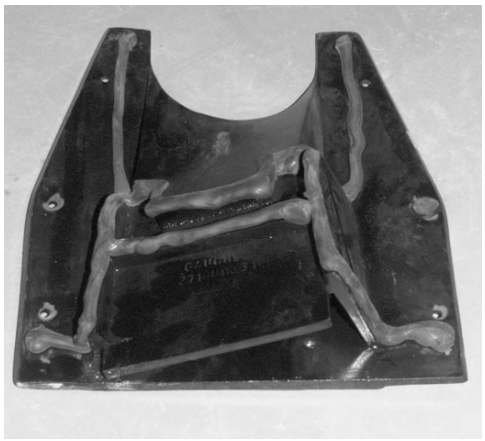
TOP VIEW

1. Mask holes
A. 20 mm (3/4 in)
B. 6 mm (1/4 in) seam



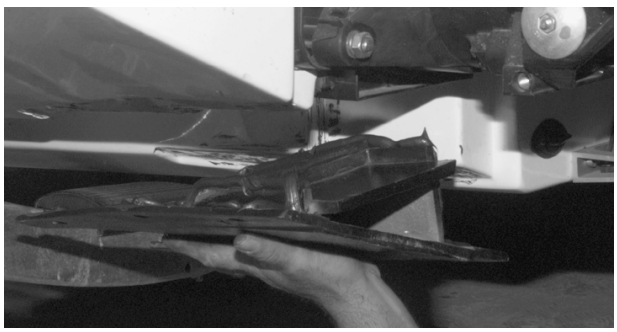
F04L4FA

SIDE VIEW


F04L4ZA

REAR VIEW

Install ride shoe on hull within 3-4 minutes after having applied Ultra-Black HB sealant.


F04L50A

Apply loctite 242 (blue) on ride shoe screw threads, then install screws.

Tighten screws in a crisscross sequence to ensure ride shoe is properly seated. Torque screws to 10 N•m (88 lbf•**in**).

Insert arm up through intake opening from beneath boat and using a finger, spread excess sealant that is lodged between the hull and ride shoe.

Apply Ultra-Black HB around screw holes on flat surface of intake grate.

Install intake grate on hull using two screws. Apply loctite 242 (blue) to screw threads.

Torque screws to 10 N•m (88 lbf•**in**).

Reconnect battery cables.

◆ WARNING

Always connect battery cables in the specified order. Connect RED positive cable first, then BLACK negative cable last.

Repeat procedure on other side.

Slide boat forward on trailer then secure using tie-downs.

Remove jack stands from beneath trailer.

▼ CAUTION

Allow sealant to cure ONE hour before putting boat in water.

Test run boat.

Challenger/Sportster Models

Open engine cover.

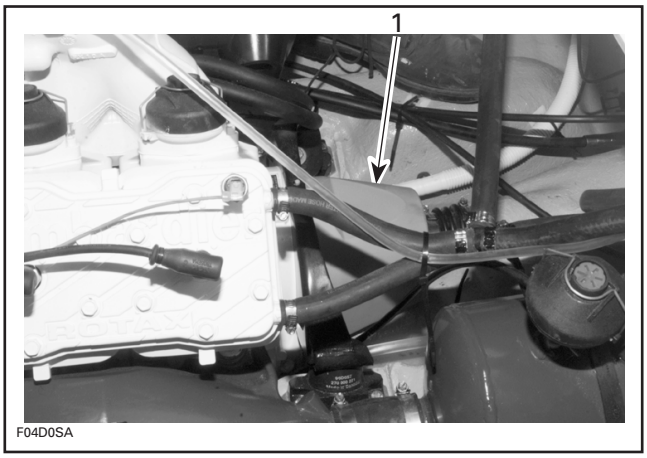
Remove storage tray.

From within engine compartment, disconnect battery cables to prevent engine starting.

◆ WARNING

Always disconnect battery cables in the specified order. Disconnect BLACK ground cable first, then RED positive cable last.

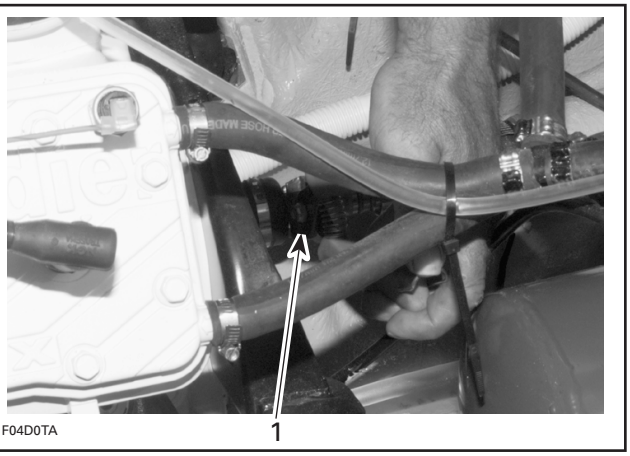
Remove flywheel guard by unscrewing the two butterfly screws and removing the two washers.



F04D0SA

1. Flywheel guard

Using Oetiker pliers, release small clamp located on PTO flywheel rubber boot.



1. Clamp

Pull floating seal toward stern (rear) of boat.

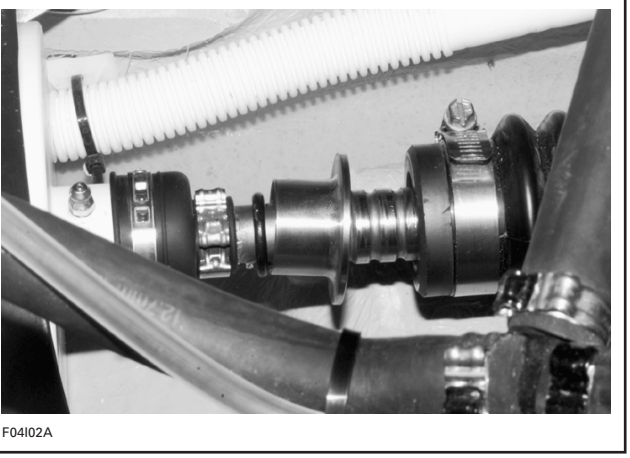
Challenger Only

Note O-ring groove position on driveshaft for reinstallation purposes.

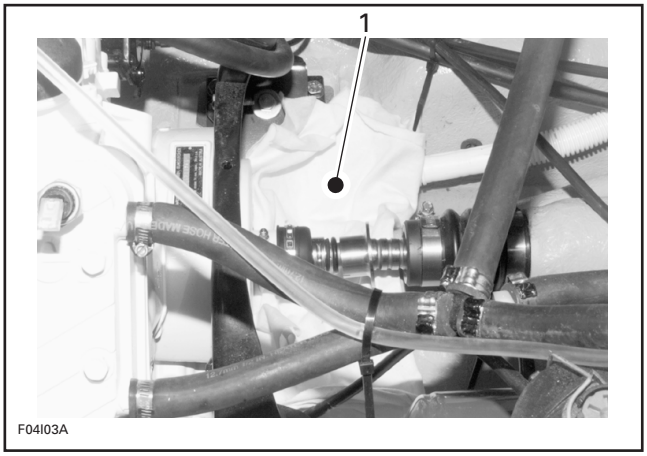
Challenger/Sportster

Slide O-ring forward, removing it from groove on driveshaft.

Slide floating seal forward completely.

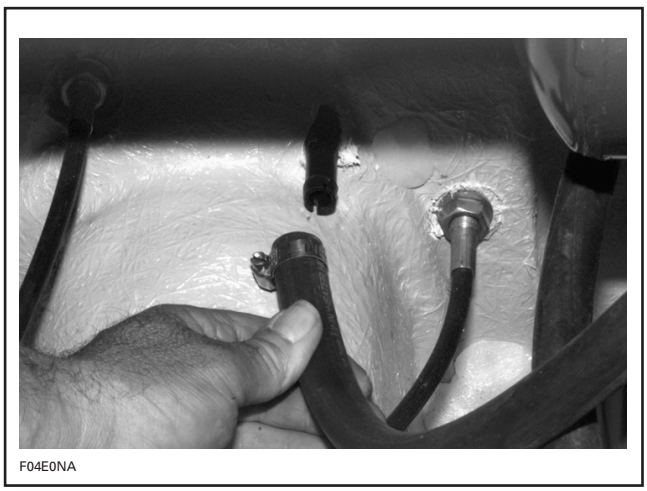


Place a clean rag beneath driveshaft, directly below PTO flywheel boot. This is necessary in order to prevent loosing the O-ring and seal carrier beneath the engine when removing pump/driveshaft assembly.



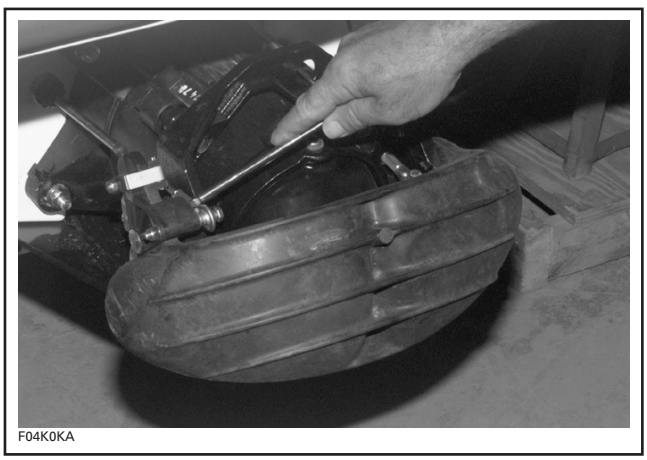
1. Clean rag

Disconnect water inlet in engine compartment from through-hull fitting.

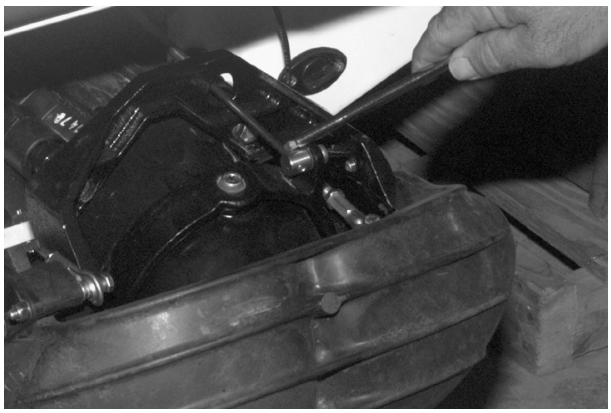


From Outside Stern (Rear) of Boat:

Remove reverse gate cable (note cable routing).



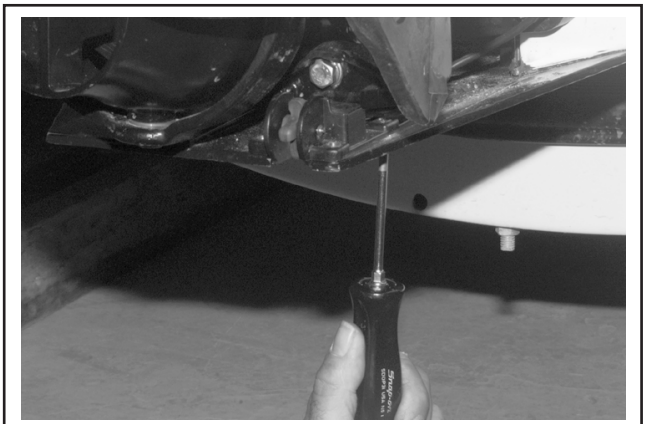
Remove VTS cable (note cable routing). Ensure to unscrew threaded bushing and to note the number of threads surpassing the bushing end for reinstallation purposes.


F04K0LA

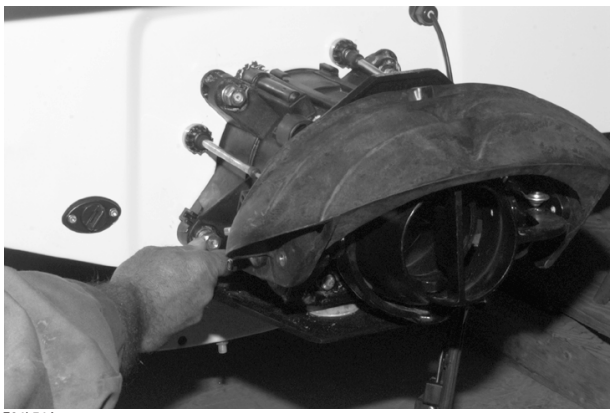
Remove steering cable (note cable routing).

F04K0MA

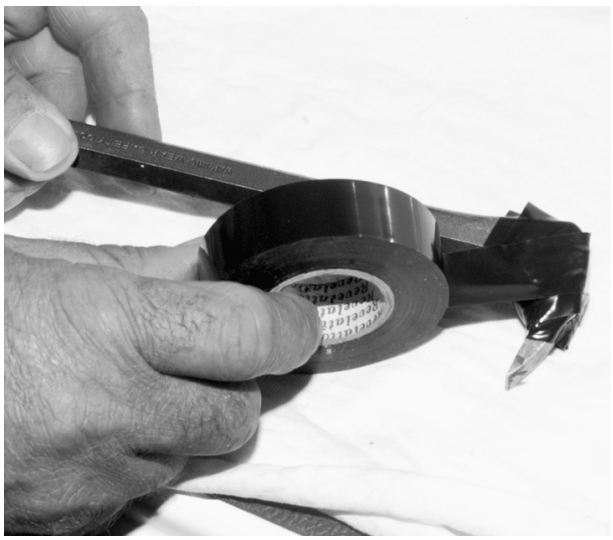
Remove six screws retaining speedometer sensor to ride shoe.


F04H2XA

Remove four nuts, lock washers and washers that are retaining pump assembly.


F04L51A

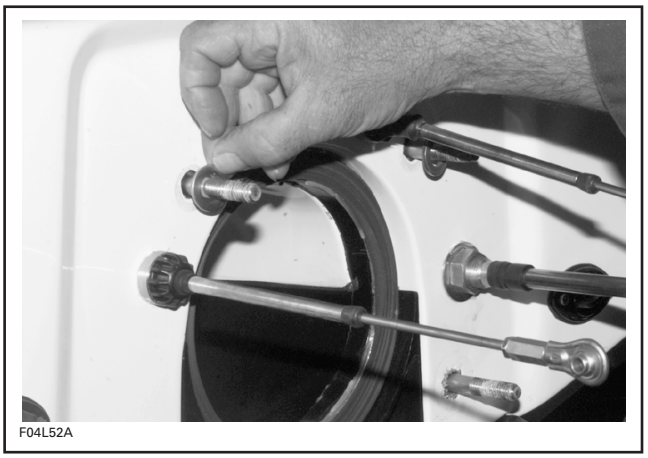
Using a curved pry bar, apply electrical tape around the curved end in order to protect hull when prying to remove pump.


F04P0LA

Pry pump evenly ensuring not to damage the threaded studs.

▼ CAUTION

Some boats may be equipped with a spacer. Ensure to note location of these shims at removal for reinstallation purposes.

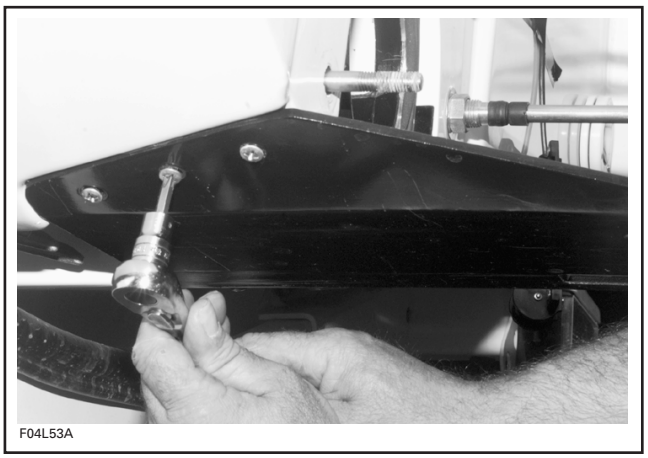

F04L52A

Remove ride shoe as follows;

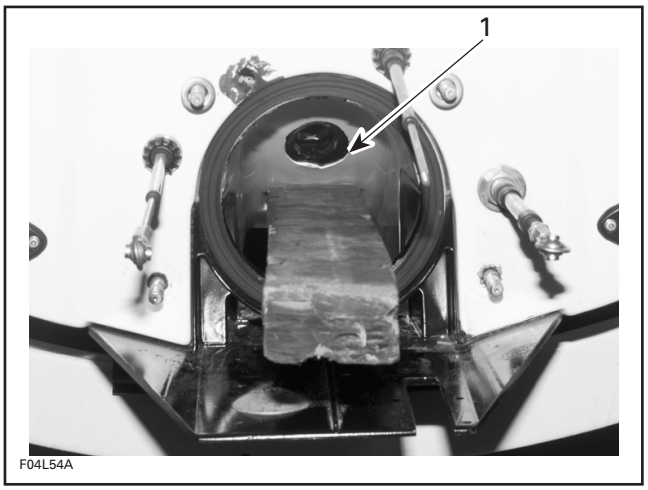
Tools Required

– Bottle jack
– 2 Heat guns
– 2" high x 3" wide x 24" long wood board
– 2" high x 6" wide x 10" long wood board

Remove six screws retaining ride shoe to boat.


F04L53A

Install the 2" x 3" 24" wood board into the intake from the rear.



F04L54A

1. Through-hull fitting

Ensure to position the end closest to the front of the boat beneath the through-hull fitting and above the intake grate.

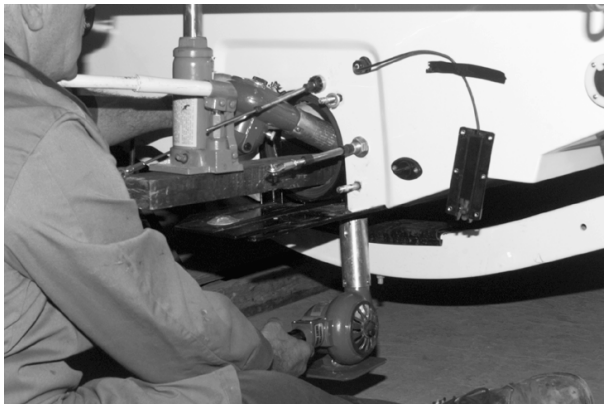
Install the bottle jack on the wood board, then insert the other wood board above the jack, beneath the boarding deck.

F04P0MA

◆ WARNING

Always work in a well ventilated area. Electrolyte or fuel vapors may be present in the vicinity.

Using heat guns, warm the entire ride shoe surface evenly while slowly pumping the jack.


F04P0NA

NOTE: It may take anywhere from 15 to 30 minutes for the ride shoe to separate from hull.

▼ CAUTION

It is imperative not to rush this procedure. Do not pump jack too quickly in order to avoid damaging ride shoe.

Allow time for sealant bond to unstick.

Once the ride shoe separates from hull, its surface will be very hot. Allow sufficient time for it to cool down prior to cleaning.

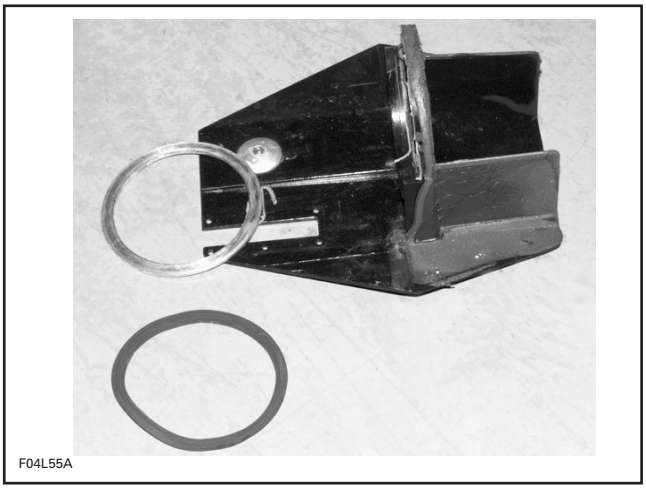
◆ WARNING

Handle ride shoe with care, its temperature will be excessively hot.

Challenger Model

Remove ring from ride shoe while surface is still warm.

Remove neoprene seal from ring, then discard neoprene seal.


F04L55A

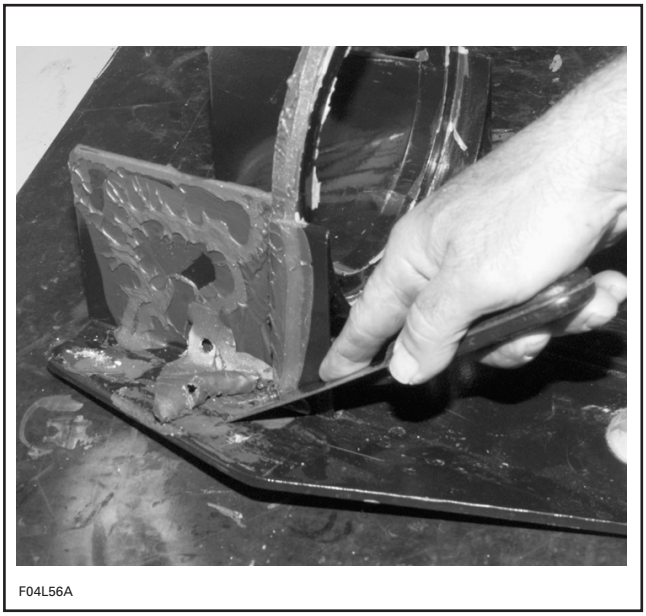
Clean ring using acetone.

Sportster Model

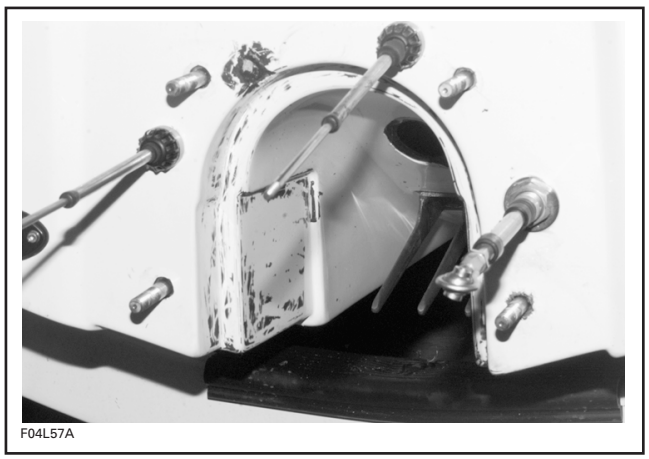
Remove neoprene seal from ride shoe, then discard neoprene seal.

Challenger/Sportster Models

Scrape all excess Ultra-Black from ride shoe and hull.

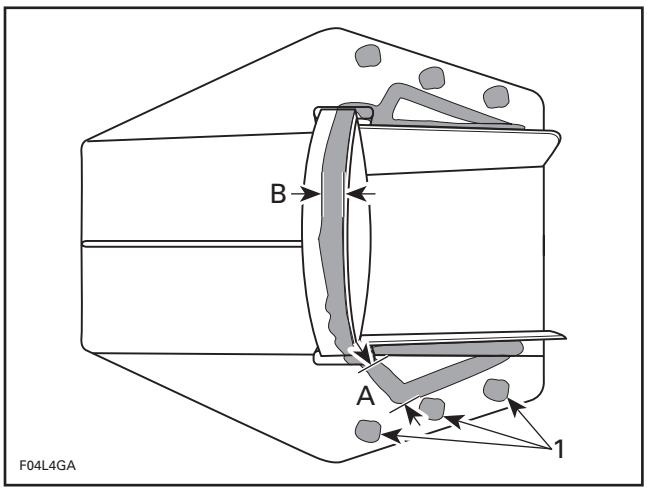

F04L56A

Clean ride shoe and hull using acetone. Ensure to eliminate grease, dust and any remaining loose Ultra-Black sealant.


F04L57A

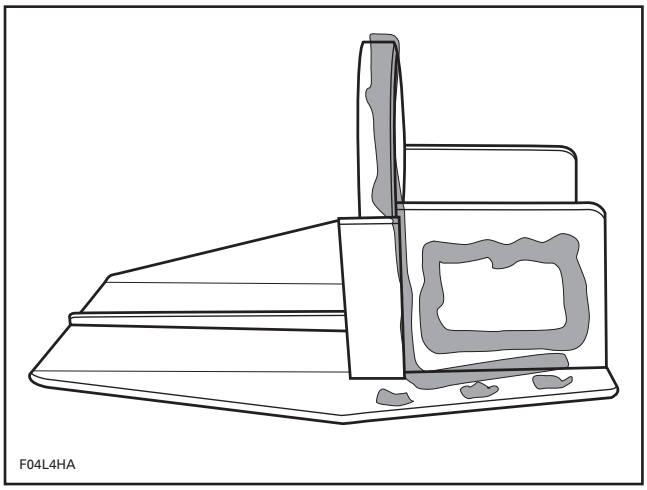
Apply paint to any unpainted/scraped surfaces using PPG paint, black 9551. This will prevent corrosion.

Apply a 6 mm (1/4 in) thick seam of Loctite Ultra-Black HB sealant (P/N 293 800 028) on ride shoe while paying close attention to the routing shown on the following illustrations.

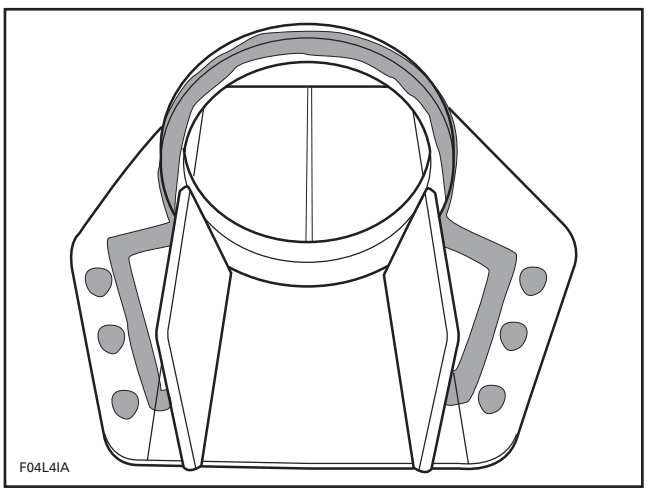


TOP VIEW

1. Mask holes
A. 25.4 mm (1 in)
B. 6 mm (1/4 in) bead


F04L4HA

SIDE VIEW


F04L4IA

FRONT VIEW

Install ride shoe on boat within 3-4 minutes after having applied Ultra-Black HB.

Apply Loctite 242 (blue) to ride shoe screw threads.

Install screws and torque to 10 N•m (88 lbf•**in**).

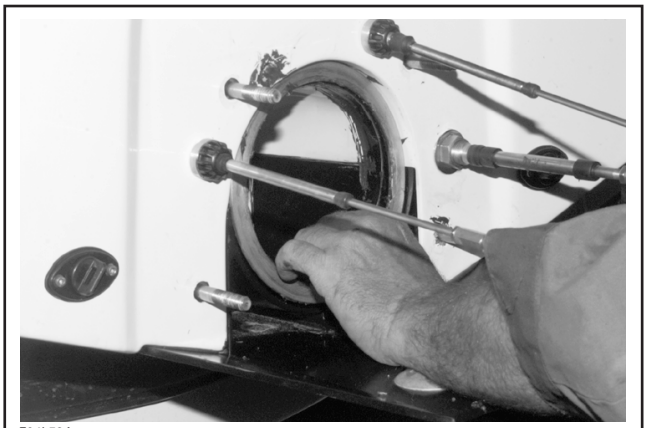
Remove remaining Ultra-Black sealant from intake.

Challenger Model

Apply a thin coat of Ultra-Black HB to one side of spacer.

F04L58A

Install spacer on ride shoe (side coated with Ultra-Black against ride shoe).


F04L59A

Remove backing paper from neoprene seal (P/N 293 200 024), install on spacer.

Sportster Model

Remove backing paper from neoprene seal (P/N 293 200 024), install on ride shoe.

Challenger/Sportster Models

Install spacers on pump studs (if equipped).

Install pump assembly (do not install washers and nuts yet).

Ensure to position reverse cable, VTS cable and steering cable in same locations as when removed.

From Within the Engine Compartment:

Install seal carrier and O-ring on driveshaft (position O-ring in the same groove as when removed).

Align driveshaft splines with PTO flywheel.

▼ CAUTION

Do not apply grease on driveshaft splines. Only after having installed driveshaft, apply grease at grease fitting on PTO flywheel.

While holding pump, guide and engage splines into PTO flywheel. Rotate driveshaft to properly index splines. Make sure boot is well positioned over shaft end.

▼ CAUTION

Grease on the carbon seal, seal carrier or O-ring(s) may cause O-ring(s) to dislodge from the(their) groove(s) and slide on the driveshaft which may allow water leakage. Always wipe off any grease.

From Stern (Rear) of Boat:

Push pump assembly up against hull.

Apply loctite 242 (blue) on pump stud threads. Install washers, lock washer and nuts then tighten equally in a crisscross sequence. Torque nuts to 35 N•m (26 lbf•ft).

From Within Engine Compartment:

Connect water inlet hose to through-hull fitting.

At PTO flywheel: compress the protective boot, slide seal carrier toward the boot and firmly push the seal carrier over the O-ring.

Secure PTO flywheel boot using Oetiker pliers.

Using a grease gun, carefully lubricate PTO flywheel at grease fitting using synthetic grease (P/N 293 550 010).

▼ CAUTION

Do grease excessively. Stop immediately when a slight movement is noticed on rubber boot.

Install flywheel guard and washers then secure with butterfly screws.

From Stern (Rear) of Boat:

Install reverse cable.

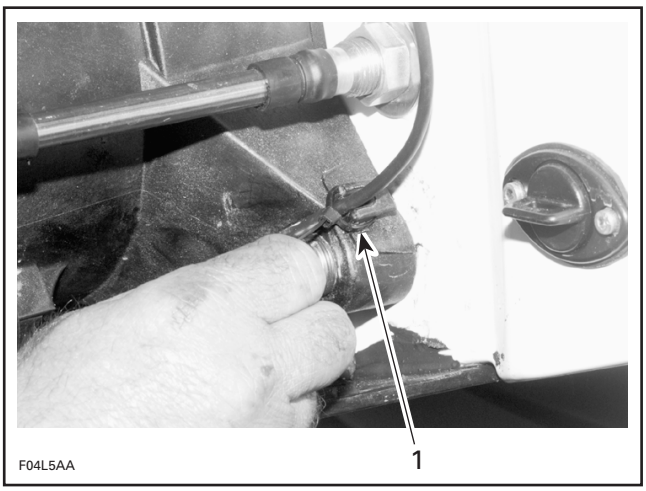
Insert VTS cable into threaded bushing (adjust number of threads as noted at removal).

Install steering cable.

Install speedometer sensor on ride shoe.

Apply Loctite 242 (blue) to screw threads then secure.

Attach speedometer sensor cable to hook on starboard side (right) of pump. Secure using a small locking tie.



Reconnect battery cables.

◆ WARNING

Always connect battery cables in the specified order. Connect RED positive cable first, then BLACK negative cable last.

Install storage tray.

Close engine cover.

Remove jack stands from beneath trailer.

▼ CAUTION

Allow sealant to cure ONE hour before putting boat in water.

Test run boat.